



PRODUCT SERVICE



EMC EMISSION - TEST REPORT

PREPARED BY: [Signature]
DATE: JAN 22 1999

Test Report No. **B847901**

Issue Date 11 November 1998

Model / Serial No. 3MB3 / 1

Product Type Cordless Base Transceiver

Client Inovonics Corporation

Manufacturer Inovonics Corporation

License holder Inovonics Corporation

Address 2100 Central Avenue
Boulder, CO 80301

Test Criteria Applied

FCC Part 15 15.249C

Limits and methods of measurement of radio disturbance characteristics of information technology equipment.

Test Result

PASS FAIL

Test Start Date 09 October 1998

09 October 1998

Test Report Project No. B241847901

B241847901

Total Pages including Appendices 41

41

Reviewed By: Felix J. Chavez
[Signature]

Reviewed By: Shawn Singh
[Signature]

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| | | |
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DIRECTORY - EMISSIONS





PRODUCT SERVICE

EMISSIONS TEST REGULATIONS :

The tests were performed according to following regulations :

- - Federal Communication Commission part 15
- - Federal Communication Commission part 15, Subpart C
- - Class A
- - 15.209
- - 15.207
- - Class B
- - 15.249

All tests performed according to ANSI C63.4.

Emission Test Results:

| | | | |
|---|----------|----------|--------------------|
| Conducted emissions 150 kHz - 30 MHz | | | |
| Test Result | ■ - PASS | □ - FAIL | □ - Not Applicable |
| Passing Margin | 17 dB | at | 26.2 MHz |
| Failing Margin | | at | |
| Remarks: | | | |

| | | | |
|--|----------|----------|--------------------|
| Radiated emissions (electric field) 30 MHz - 1000 MHz | | | |
| Test Result | ■ - PASS | □ - FAIL | □ - Not Applicable |
| Passing Margin | 3.2 dB | at | 31.2 MHz |
| Failing Margin | | at | |
| Remarks: | | | |

| | | | |
|--|----------|----------|--------------------|
| Radiated emissions (electric field) 920.27 MHz - 9248.2 MHz | | | |
| Test Result | ■ - PASS | □ - FAIL | □ - Not Applicable |
| Passing Margin | 2.8 dB | at | 9202.3 MHz |
| Failing Margin | | at | |
| Remarks: | | | |

GENERAL REMARKS:

Modifications required to pass: None

Test Specification Deviations: Additions to or Exclusions from: None

Colorado Test Equipment

25-Sep-98

Report: 88479

Date: 09 OCT 98

Signature: Shawn S. J...

Atmo. Pressure: 81 kPa

Temp: 23.2

Rel. Humid.: 26%

Model Number Serial Number Description

Cal Date Cal Due

| Location | Tests | Manufacturer | Model Number | Serial Number | Description | Cal Date | Cal Due |
|----------|-------|-------------------|---------------|---------------|--|-----------|-----------|
| PW | R | AH Systems | SAS-200/510 | 705 | Log Periodic Antenna (300-1800 MHz) | 06-Jul-98 | |
| PW | R | AH Systems | SAS-200/512 | 104 | Log Periodic Antenna (200-1500 MHz) | 13-Jul-98 | |
| PW | R | AH Systems | SAS-200/542 | 256 | Biconical Antenna | 03-Feb-98 | |
| PW | R | Avantek | AF197-8434-10 | 1007 | RF Pre-Amplifier (4-8 GHz) | 18-Nov-97 | 18-Nov-98 |
| PW | R | Avantek | AWT-18037 | 1002 | RF Pre-Amplifier (8-18 GHz) | 18-Nov-97 | 18-Nov-98 |
| PW | R | bird | 4022 | 1825 | Sensor, 25 to 1000 MHz | | |
| PW | R | bird | 4024 | 1863 | Sensor, 1.5 to 32 MHz | | |
| PW | R | bird | 4025 | 3702 | Sensor, 100 to 2500kHz | | |
| PW | R | bird | 4421-103 | 1254 | Metering Unit | | |
| PW | R | California Instr. | 850T-1 | 68458 | Oscillator (45-5000 Hz) | 08-Mar-98 | 08-Mar-99 |
| PW | R | Compag | 9000TCA/3-1 | 50666+ | Power Source 9KVA (45-5000 Hz, 0-280VAC) | | |
| PW | R | Compag | 470A | 23605277B504 | Monitor - PW Tested | | |
| PW | R | Compag | DeskPro 575 | 6545HSY20483 | Computer for PW Tested | | |
| PW | R | Compliance Desig | none | RD-1 | Roberts Dipole Ant. Set (30-1000 MHz) | 03-Mar-97 | 02-Mar-00 |
| PW | R | EMC Test Systems | 3109 | 3142 | Biconical Antenna | 27-Jan-98 | 27-Jan-99 |
| PW | R | EMCO | 1070-4 | 9206-1681 | Antenna tower with manual polarization | | |
| PW | R | EMCO | 1080/1081 | 9206-1636 | 2 meter dia. wood turntable | | |
| PW | R | EMCO | 1090 | 1134 | Multiple Device Controller | | |
| PW | R | EMCO | 3108 | 2149 | Biconical Dipole Antenna (30-300 MHz) | 19-Jun-98 | 19-Jun-99 |
| PW | R | EMCO | 3115 | 0886 | DBI Ridged Horn Antenna (1-18 GHz) | 20-Feb-98 | 20-Feb-99 |
| PW | R | EMCO | 3146 | 9203-3376 | Log Periodic Antenna | 18-Jun-98 | 18-Jun-99 |
| PW | R | EMCO | 3825/2 | 9202-1945 | LI5N | 15-Jul-98 | 15-Jul-99 |
| PW | R | EMCO | 3825/2 | 9202-1946 | LI5N | 08-Jul-98 | 08-Jul-99 |
| PW | R | EMCO | 3825/2 | 9202-1946 | LI5N | 23-Jul-98 | 23-Jul-99 |
| PW | R | EMCO | 4610 | 9205-1199 | Royce field site source | | |
| PW | R | EMCO | 4620 | 9110-1015 | Conducted noise source | | |
| PW | R | EMCO | 6502 | 2082 | Magnetic Field Loop | | |
| PW | R | EMCO | 6502 | 9205-2738 | Magnetic loop | 30-Oct-97 | 28-Oct-00 |
| PW | R | EMCO | 7123 | 9205-1028 | Field Strength Sensor | | |
| PW | R | EMCO | 7123 | 9205-1029 | Field Strength Sensor | 11-Dec-98 | |
| PW | R | EMCO | 7405 | 9203-2175 | Near field probe set | | |
| PW | R | Fischer | F-201 | 141 | Absorbing Clamp (30-300 MHz) | 05-Mar-98 | 05-Mar-99 |
| PW | R | Fischer | F-33-1 | 358 | Current Probe (10 kHz - 250 MHz) | 04-May-98 | 04-May-99 |
| PW | R | Fischer Custom Co | F-61 | 274 | Current Probe | 17-Jun-97 | 17-Jun-98 |
| PW | R | Fischer Custom Co | F-61 | 274 | Current Probe | 30-Jul-98 | 30-Jul-99 |
| PW | R | Gishard | 600-1040 mb | 002 | Allinmeter | | |
| PW | R | Hewlett Packard | 11940A | 2650A04527 | Close field probe | | |
| PW | R | Hewlett Packard | 11940A | 2650A04563 | Close field probe | | |
| PW | R | Hewlett Packard | 11941A | 2807A02957 | Close field probe | | |
| PW | R | Hewlett Packard | 11947A | 2820A00277 | Transient Limiter | 18-Nov-98 | 18-Nov-99 |
| PW | R | Hewlett Packard | 11947A | 3107A01975 | Transient Limiter | 17-Jun-98 | 17-Jun-99 |
| PW | R | Hewlett Packard | 8444A | 2325A07899 | Tracking Generator (1-1200 MHz) | 18-Nov-97 | 18-Nov-98 |
| PW | R | Hewlett Packard | 8447D | 2727A05399 | Amplifier (30-1000 MHz) | 18-Nov-97 | 18-Nov-98 |
| PW | R | Hewlett Packard | 8447F | 3113A04923 | Option H64 Dual Preamp | 21-Nov-97 | 21-Nov-98 |
| PW | R | Hewlett Packard | 85650A | 2013A00258 | Quest Peak Adapter (set 1) | 17-Jun-95 | 17-Jun-96 |
| PW | R | Hewlett Packard | 85650A | 2811A01300 | Quest Peak Adapter | 11-Mar-98 | 11-Mar-99 |
| PW | R | Hewlett Packard | 85662A | 2112A0220 | Display Section | 11-Mar-98 | 11-Mar-99 |
| PW | R | Hewlett Packard | 85662A | 2318A04983 | Display Section (set 1) | 17-Jun-98 | 17-Jun-99 |
| PW | R | Hewlett Packard | 85662A | 2403A06707 | Display Section (Loamer) | 20-Nov-97 | 20-Nov-98 |
| PW | R | Hewlett Packard | 85662A | 2403A08749 | Display Section | 01-Apr-98 | 30-Sep-98 |
| PW | R | Hewlett Packard | 85668 | 2410A00154 | Spectrum Analyzer (dc-22 GHz) | 01-Apr-98 | 30-Sep-98 |

| Location | Tests | Manufacturer | Model Number | Serial Number | Description | Cal Date |
|----------|--------------------|----------------------|---------------|---------------|---|-----------|
| PW | R, C | Hewlett Packard | 8568B | 2410A00254 | Spectrum Analyzer (Loarer) | 20-Nov-97 |
| PW | R, C, RE101, CISP | Hewlett Packard | 8568B | 2304A02508 | Spectrum Analyzer (set 1) (dc-1.8 GHz) | 17-Jun-98 |
| PW | RE101, -8, -9, -11 | Hewlett Packard | 8594E | 3223A00145 | Spectrum Analyzer | 21-Nov-97 |
| PW | C | HP | 11947A | 3107A01984 | Transient Limiter | 09-Jun-97 |
| PW | | JFW | 50FH-003-100N | 9825 | Attenuator | 18-Jun-98 |
| PW | | JFW | 50FHB-003-5 | 00363 | Attenuator | 18-Nov-97 |
| PW | | Mini-Circuits | ZHL-1042J | D020698-14 | RF Pre-Amplifier (10-4200 MHz) | 13-Feb-98 |
| PW | | Mini-Circuits | ZHL-1042J | N032698 | RF Pre-Amplifier (30-4000 MHz) | 11-May-98 |
| PW | C | Polaroid Electronics | ESH3-ZZ | 357.881J32 | Transient Limiter | |
| PW | X | Radio Shack | 63-857 | 005 | Temperature / Humidity Indicator | |
| PW | C, R | Rhode & Schwarz | ESHS 30 | 842806/001 | EMI Test Receiver | 07-Oct-97 |
| PW | C | Rhode & Schwarz | ESH2-Z5 | 830364/002 | LISN 50 ohm/50uH 3 line (1kHz - 30 MHz) | 23-Feb-98 |
| PW | C | Rhode & Schwarz | ESH3 | 872318/036 | Low Frequency Receiver (9 kHz - 30 MHz) | 08-Aug-97 |
| PW | C | Rhode & Schwarz | ESH3 | 872318/036 | Low Frequency Receiver (9 kHz - 30 MHz) | 03-Sep-98 |
| PW | R | Rhode & Schwarz | HFH2-ZZ | 880685/042 | Loop Antenna (10 kHz - 30 MHz) | 08-Feb-98 |
| PW | | Schwarzbeck | NNLK 8129 | 8129128 | LISN | 20-Oct-97 |
| PW | C | Schwarzbeck | TK 9416 | TUV-600 | Conducted Line Probe (150 kHz - 30 MHz) | 04-Apr-98 |
| PW | | Shafter | NSG 431 | 1428 | ESD Tester | |
| PW | C | Solar | 8028-50-TS-24 | 8305121 | LISN | 23-Feb-98 |
| PW | C | Solar | 8028-50-TS-24 | 8305122 | LISN (10 kHz - 30 MHz) | 23-Feb-98 |
| PW | | Tensor | 4105 | 2020 | Rigged Guide Antenna | 11-Jun-98 |
| PW | | Transjonic | T-100 | 147 | Ion Meter | |
| PW | | TUV PS | LPS-1 | 1 | P/S for Loop Antenna | |
| PW | | WaveTek | DMSXL | 60206553 | Hand Held Multimeter | |
| PW | | Weinschel | 2-3dB | BC5530 | Attenuator | 18-Nov-97 |
| PW | | Weinschel | 2-3dB | BC5539 | Attenuator | 18-Nov-97 |
| PW | | Weinschel | 2-6B | BC6492 | Attenuator | 18-Nov-97 |
| PW | | Weinschel | 2-6dB | BC8487 | Attenuator | 18-Nov-97 |

Transmitter Data Sheets

Appendix A

15.249 INTENTIONAL RADIATOR DATA

TÜV PRODUCT SERVICE INC

Date: 9-Oct-98
 EUT: 3MBS
 Customer: Donald J. Hume

Measured @
 Low Freq.: 920.26 MHz
 High Freq. 924.77 MHz

Tx Mode: Radiated Measurements

Fundamental Field Strength Specification
 93.9 dBuV/m

Peak Measurement @ MHz Delta
 dBuV/m @ MHz dB
 91.0 920.3 -2.9

Harmonics

Range Specification
 dBuV/m @ MHz dB

| | | | | |
|-------------------------------|-----------|------|--------|------|
| 2nd harmonic (1840-1850 MHz) | 54 dBuV/m | 44.7 | 1849.6 | -9.3 |
| 3rd harmonic (2760-2774 MHz) | 54 dBuV/m | 46.8 | 2760.7 | -7.2 |
| 4th harmonic (3681-3697 MHz) | 54 dBuV/m | 47.0 | 3680.9 | -7.0 |
| 5th harmonic (4601-4624 MHz) | 54 dBuV/m | 48.3 | 4601.2 | -5.7 |
| 6th harmonic (5521-5549 MHz) | 54 dBuV/m | 44.2 | 5521.4 | -9.8 |
| 7th harmonic (6441-6474 MHz) | 54 dBuV/m | 44.8 | 6441.8 | -9.2 |
| 8th harmonic (7362-7399 MHz) | 54 dBuV/m | 45.8 | 7361.8 | -8.2 |
| 9th harmonic (8282-8223 MHz) | 54 dBuV/m | 47.4 | 8282.1 | -8.6 |
| 10th harmonic (9202-9248 MHz) | 54 dBuV/m | 51.2 | 9202.3 | -2.8 |

Minimum Passing Margin: -2.8 dB

Detailed Test Data Sheets

Appendix B



PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 2
 Date 10/09/98 Page 1
 Engineer *RK 308*
 Tech: S S *Starr Singh*
 Requester _____

 Frequency Level dB
 Factor Cable dB
 Final Az Polar \ dBuV/m deg Height
 Delta Delta

All frequencies are fully maximized. Peak readings.
 Investigating TX fundamental, and harmonics.

Low channel.

Log periodic antenna.
 60 deg/1 m

| | | | | | | | |
|---------------|-------|------|-----|------|----|---|----|
| 920.27 | 66 | 23.2 | 2 | 91.2 | -- | H | -- |
| 94 deg/1.4 m | | | | | | | |
| 920.28 | 61.35 | 23.2 | 2 | 86.5 | -- | V | -- |
| 127 deg/1.1 m | | | | | | | |
| 1840.5 | 13.15 | 28.4 | 2.8 | 44.4 | -- | V | -- |
| 2760.7 | 12.1 | 31.1 | 3.6 | 46.8 | -- | V | -- |
| 3680.9 | 9.5 | 33.3 | 4.1 | 47 | -- | V | -- |
| 40 deg/1 m | | | | | | | |
| 1840.5 | 12.7 | 28.4 | 2.8 | 43.9 | -- | H | -- |
| 2760.7 | 10.9 | 31.1 | 3.6 | 45.6 | -- | H | -- |
| 3680.9 | 8.55 | 33.3 | 4.1 | 46 | -- | H | -- |
| 4601.3 | 8.45 | 34.1 | 4.8 | 47.4 | -- | H | -- |
| 5521.5 | 1.45 | 36.2 | 5.2 | 42.9 | -- | H | -- |
| 6441.7 | .8 | 36.4 | 5.5 | 42.7 | -- | H | -- |
| 7361.9 | -.65 | 38 | 5.7 | 43 | -- | H | -- |
| 105 deg/1.1 m | | | | | | | |
| 4601.2 | 9.35 | 34.1 | 4.8 | 48.3 | -- | V | -- |
| 5521.4 | 2.8 | 36.2 | 5.2 | 44.2 | -- | V | -- |
| 6441.6 | 2.95 | 36.4 | 5.5 | 44.8 | -- | V | -- |
| 7361.8 | 2.1 | 38 | 5.7 | 45.8 | -- | V | -- |
| 8282.1 | 3.05 | 38.3 | 6 | 47.4 | -- | V | -- |
| 9202.3 | 4.8 | 40.2 | 6.3 | 51.2 | -- | V | -- |
| 40 deg/1 m | | | | | | | |
| 9202.3 | 4.75 | 40.2 | 6.3 | 51.2 | -- | H | -- |
| 8282.1 | 2.55 | 38.3 | 6 | 46.9 | -- | H | -- |

TUV PRODUCT SERVICE
 RADIATED EMISSIONS

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 2
 Date 10/09/98 Page 2
 Engineer Eric S. Smith
 Tech: S S Smith
 Requester

Frequency Level Factor Cable Final Az Polar \ dBV/m deg Height Delta Delta

| | | | | | | | | | |
|--------|------|------|-----|------|----|---|----|---|----|
| 8282.1 | 2.35 | 38.3 | 6 | 46.7 | -- | H | -- | H | -- |
| 9202.3 | 4.45 | 40.2 | 6.3 | 50.9 | -- | V | -- | V | -- |
| 8282.1 | 3 | 38.3 | 6 | 47.3 | -- | V | -- | V | -- |

Disregard above four readings with high channel.

105 deg/1.1 m

| | | | | | | | | | |
|--------|------|------|-----|------|----|---|----|---|----|
| 8323.3 | 2.35 | 38.4 | 6 | 46.8 | -- | V | -- | V | -- |
| 9248.2 | 3.25 | 40 | 6.3 | 49.5 | -- | V | -- | V | -- |

40 deg/1 m

| | | | | | | | | | |
|--------|------|------|-----|------|----|---|----|---|----|
| 8323.3 | 2.65 | 38.4 | 6 | 47.1 | -- | H | -- | H | -- |
| 9248.2 | 4.05 | 40 | 6.3 | 50.3 | -- | H | -- | H | -- |

| | | | | | | | | | |
|--------|------|------|-----|------|----|---|----|---|----|
| 4624.0 | 6.95 | 34.1 | 4.8 | 45.9 | -- | H | -- | H | -- |
| 5548.9 | 1.4 | 36.3 | 5.2 | 42.9 | -- | H | -- | H | -- |
| 6473.7 | .8 | 36.3 | 5.5 | 42.6 | -- | H | -- | H | -- |
| 7398.5 | -0.9 | 38 | 5.7 | 42.9 | -- | H | -- | H | -- |

| | | | | | | | | | |
|--------|------|------|-----|------|----|---|----|---|----|
| 7398.5 | -2.3 | 38 | 5.7 | 41.5 | -- | V | -- | V | -- |
| 6473.7 | .3 | 36.3 | 5.5 | 42.1 | -- | V | -- | V | -- |
| 5548.9 | .7 | 36.3 | 5.2 | 42.2 | -- | V | -- | V | -- |
| 4624.0 | 7.8 | 34.1 | 4.8 | 46.8 | -- | V | -- | V | -- |

Above readings were maximum at 105 deg/1.1 m

120 deg/1.1 m

| | | | | | | | | | |
|--------|-------|------|-----|------|----|---|----|---|----|
| 1849.6 | 13.15 | 28.4 | 2.8 | 44.4 | -- | V | -- | V | -- |
| 2774.4 | 7.35 | 31.1 | 3.6 | 42.1 | -- | V | -- | V | -- |
| 3699.2 | 6.9 | 33.4 | 4.1 | 44.4 | -- | V | -- | V | -- |

40 deg/1 m

TUV PRODUCT SERVICE

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 2
 Date 10/09/98 Page 3
 Engineer *Eric J. ...*
 Tech: S S *Shawn S. ...*
 Requester

Frequency Level Factor cable Final Az Polar \

| Mhz | dBV | dB | dB | dBV/m | deg Height | Delta |
|--------|------|------|-----|-------|------------|-------|
| 3699.2 | 6.6 | 33.4 | 4.1 | 44.1 | -- H -- | Delta |
| 2774.4 | 4.85 | 31.1 | 3.6 | 39.6 | -- H -- | Delta |
| 1849.6 | 13.5 | 28.4 | 2.8 | 44.7 | -- H -- | Delta |

TUV PRODUCT SERVICE

RADIATED EMISSIONS

Figure

Report B8479 Run 2
 Date 10/09/98 Page 4
 Engineer *FLR*
 Tech: S S *Simon S.M.G.*
 Requester

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Measurement Summary

Frequency MHz
 Final dBuV/m
 Azimuth deg
 Polar\ Height
 Delta Delta

| | | | | | |
|--------|------|--------|----|---|----|
| 920.27 | 91.2 | 36307. | -- | H | -- |
| 1840.5 | 44.4 | 165.95 | -- | V | -- |
| 1849.6 | 44.7 | 171.79 | -- | V | -- |
| 2760.7 | 46.8 | 218.77 | -- | V | -- |
| 2774.4 | 42.1 | 127.35 | -- | V | -- |
| 3680.9 | 47 | 223.87 | -- | V | -- |
| 3699.2 | 44.4 | 165.95 | -- | V | -- |
| 4601.2 | 48.3 | 260.01 | -- | V | -- |
| 4624.0 | 46.8 | 218.77 | -- | V | -- |
| 4624.4 | 44.2 | 162.18 | -- | V | -- |
| 5548.9 | 42.9 | 139.63 | -- | H | -- |
| 6441.6 | 44.8 | 173.78 | -- | V | -- |
| 6473.7 | 42.6 | 134.89 | -- | H | -- |
| 7361.8 | 45.8 | 194.98 | -- | V | -- |
| 7398.5 | 42.9 | 139.63 | -- | H | -- |
| 8282.1 | 47.4 | 234.42 | -- | V | -- |
| 8323.3 | 47.1 | 226.46 | -- | H | -- |
| 9202.3 | 51.2 | 363.07 | -- | V | -- |
| 9248.2 | 50.3 | 327.34 | -- | H | -- |

File B8479 Run 2

RADIATED EMISSIONS

PW1 Test Site
3 Meter Antenna Distance
Equipment Under Test:
Inovonics Corp. M/N: 3MB3
Cordless Base Transceiver
Notes: S/N: 1, 12 Vdc

Report B8479 Run 3
Date 10/09/98 Page 1
Engineer *ELJ*
Tech: S S *Smith S.M.P.*
Requester

Frequency Level Factor Cable Final Az Polar \
MHz dBV dB dB dBV/m deg Height
Delta Delta

Continuation of RUN 2.

Log periodic antenna

| | | | | | | | |
|--------------|------|------|---|----|----|---|----|
| 924.77 | 60.2 | 22.8 | 2 | 85 | -- | V | -- |
| 94 deg/1.4 m | | | | | | | |
| 924.77 | 64.2 | 22.8 | 2 | 89 | -- | H | -- |
| 60 deg/1 m | | | | | | | |

RADIATED EMISSIONS

Figure

PW1 Test Site
3 Meter Antenna Distance
Equipment Under Test:
Inovonics Corp. M/N: 3MB3
Cordless Base Transceiver
Notes: S/N: 1, 12 Vdc

Report B8479 Run 3
Date 10/09/98 Page 2
Engineer *ELK & S.*
Tech: S S *S. M. J.*
Requester

Measurement Summary

| Frequency MHz | Final dBuV/m | Azimuth deg | Polar Height | Delta | Delta |
|------------------|-----------------|----------------|-----------------|-------|-------|
| 924.77 | 89 | 28183. | H -- | | |

File B8479 Run 3

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 4
 Date 10/09/98 Page 1
 Engineer *[Signature]*
 Tech: DMK
 Requester *[Signature]*

| Frequency Level | Factor | Cable | Final | Az | Polar | Delta | FCC B | Delta |
|-----------------|--------|-------|-------|-----|--------|-------|-------|-------|
| MHz | dB | dB | dB | deg | Height | | | |

30 - 5000 MHz.

Investigating incorporated digital circuitry, receiver I.O., and harmonics.

High channel
 111 degrees azimuth, antenna height 1.2 meters.

| | | | | | | | | |
|--------|------|----|-----|------|----|---|----|-------|
| 744.83 | 7.65 | 21 | 1.7 | 30.4 | -- | H | -- | -15.6 |
|--------|------|----|-----|------|----|---|----|-------|

Above reading was in vertical polarization.

Horizontal polarization.

277 degrees azimuth, antenna height 1 meter.

| | | | | | | | | |
|--------|------|----|-----|------|----|---|----|-------|
| 744.59 | 5.95 | 21 | 1.7 | 28.7 | -- | V | -- | -17.3 |
|--------|------|----|-----|------|----|---|----|-------|

Low channel

| | | | | | | | | |
|--------|-----|------|-----|------|----|---|----|-------|
| 740.24 | 8.9 | 21.3 | 1.7 | 31.9 | -- | V | -- | -14.1 |
|--------|-----|------|-----|------|----|---|----|-------|

Above two readings were in horizontal polarization.

Vertical polarization.

60 degrees azimuth, antenna height 1.2 meters.

| | | | | | | | | |
|--------|---|------|-----|----|----|---|----|-----|
| 740.24 | 4 | 21.3 | 1.7 | 27 | -- | V | -- | -19 |
|--------|---|------|-----|----|----|---|----|-----|

Checking Low Channel, harmonics from 1-5 GHz, Vertical.

| | | | | | | | | |
|--------|-----|------|-----|------|----|---|----|-------|
| 1480.4 | 2.2 | 26.9 | 2.5 | 31.6 | -- | V | -- | -22.4 |
|--------|-----|------|-----|------|----|---|----|-------|

37 degrees, 1.3 meters, Vert.

| | | | | | | | | |
|--------|-------|------|-----|------|----|---|----|-------|
| 2220.7 | -5.45 | 29.8 | 3.2 | 27.5 | -- | V | -- | -26.5 |
|--------|-------|------|-----|------|----|---|----|-------|

40 deg. 1.2 meters

TUV PRODUCT SERVICE

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 4
 Date 10/09/98 Page 2
 Engineer *[Signature]*
 Tech: DMK
 Requester

| Frequency | Level | Factor | Cable | Final | Az Polar\ | deg Height | Delta | Delta |
|-----------|-------|--------|-------|-------|-----------|------------|-------|-------|
| MHz | dBV | dB | dB | dBV/m | | | | |

| | | | | | | | | |
|---------------|------|-----|------|--|---|----|-------|--|
| 2960.9 - 5.7 | 31.4 | 3.8 | 29.5 | | V | -- | -24.5 | |
| Noise Floor | | | | | | | | |
| 3701.2 - 4.85 | 33.4 | 4.2 | 32.7 | | V | -- | -21.3 | |
| noise floor | | | | | | | | |
| 4441.4 - 6.2 | 33.9 | 4.7 | 32.3 | | V | -- | -21.7 | |
| noise floor | | | | | | | | |

Changing to Horizontal.

| | | | | | | | | |
|---|------|------|------|------|---|----|-------|-------|
| 1480.4 | 4.55 | 26.9 | 2.5 | 33.9 | | H | -- | -20.1 |
| The above reading is max at 300 degrees, 1.1 meters | | | | | | | | |
| 2220.7 - 7.7 | 29.8 | 3.2 | 25.2 | | H | -- | -28.8 | |
| The above reading is the noise floor, no signal detected. | | | | | | | | |
| 2960.9 - 6.25 | 31.4 | 3.8 | 29 | | H | -- | -25 | |
| noise floor | | | | | | | | |
| 3701.2 - 5.15 | 33.4 | 4.2 | 32.4 | | H | -- | -21.6 | |
| noise floor | | | | | | | | |
| 4441.4 - 6.4 | 33.9 | 4.7 | 32.1 | | H | -- | -21.9 | |
| noise floor | | | | | | | | |

Changing to the HIGH CHANNEL, checking 1-5 GHz harmonics. HORIZONTAL.

| | | | | | | | | |
|---|------|-----|------|------|---|----|-------|-------|
| 1489.6 | 2.45 | 27 | 2.5 | 31.9 | | H | -- | -22.1 |
| The above reading is max at 86 deg. 1.2 meters | | | | | | | | |
| 2234.4 - 7.55 | 29.8 | 3.2 | 25.4 | | H | -- | -28.6 | |
| The above reading is the noise floor, no signal detected. | | | | | | | | |
| 2979.2 - 6.35 | 31.5 | 3.8 | 28.9 | | H | -- | -25.1 | |
| noise floor | | | | | | | | |

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 4
 Date 10/09/98 Page 3
 Engineer *[Signature]*
 Tech: DMK
 Requester

 MHz dbV db dB
 Frequency Level Factor Cable Final Az Polar\ deg Height
 Delta FCC B Delta

3724.0 -5 33.5 4.2 32.6 -- H --
 The above reading is the noise floor
 4468.8 -6.85 33.8 4.7 31.7 -- H --
 noise floor
 Changing to Vertical.

1489.6 1.35 27 2.5 30.8 -- V --
 320 degrees, 1.4 meters, Vertical

2234.4 -8.05 29.8 3.2 24.9 -- V --
 noise floor

2979.2 -6.1 31.5 3.8 29.2 -- V --
 noise floor

3724.0 1.45 33.5 4.2 39.1 -- V --
 150 deg. 1.4 meters

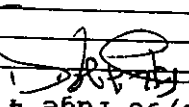
4468.8 -6.35 33.8 4.7 32.2 -- V --
 noise floor

Checking 1-5 GHz , Vertical , OTHER THAN L.O. harmonics previously checked.
 Full turntable rotation , no emissions other than those already measured.
 Checking Horizontal, 1-5 GHz.
 Full turntable rotation, no emissions other than those already measured.

TUV PRODUCT SERVICE

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 4
 Date 10/09/98 Page 4
 Engineer: 
 Tech: DMK
 Requester:

Frequency Level Factor Cable dB dB Final dBV/m Az Polar\ deg Height FCC B Delta Delta

Checking unintentional and the 152.7 MHz L.O. from 30-1,000 MHz

 Bicon Antenna, Vertical.
 0 degrees

| 30.036 | 10.8 | 13.8 | .4 | 25 | -- | V | -- | -15 |
|--------|-------|------|----|------|---|-------------------------------|-------------------|-------|
| 31.212 | 16.2 | 13.7 | .4 | 30.3 | -- <td>V <td>-- <td>-9.7</td> </td></td> | V <td>-- <td>-9.7</td> </td> | -- <td>-9.7</td> | -9.7 |
| 36.024 | 10.35 | 13.1 | .4 | 23.9 | -- <td>V <td>-- <td>-16.1</td> </td></td> | V <td>-- <td>-16.1</td> </td> | -- <td>-16.1</td> | -16.1 |
| 47.953 | 10.45 | 11.7 | .5 | 22.6 | -- <td>V <td>-- <td>-17.4</td> </td></td> | V <td>-- <td>-17.4</td> </td> | -- <td>-17.4</td> | -17.4 |
| 50.496 | 12.4 | 11.4 | .5 | 24.3 | -- <td>V <td>-- <td>-15.7</td> </td></td> | V <td>-- <td>-15.7</td> </td> | -- <td>-15.7</td> | -15.7 |
| 60.015 | 7 | 10.2 | .5 | 17.7 | -- <td>V <td>-- <td>-22.3</td> </td></td> | V <td>-- <td>-22.3</td> </td> | -- <td>-22.3</td> | -22.3 |
| 72.009 | 8.25 | 8.8 | .5 | 17.6 | -- <td>V <td>-- <td>-22.4</td> </td></td> | V <td>-- <td>-22.4</td> </td> | -- <td>-22.4</td> | -22.4 |
| 84.019 | 8.85 | 8.2 | .6 | 17.6 | -- <td>V <td>-- <td>-22.4</td> </td></td> | V <td>-- <td>-22.4</td> </td> | -- <td>-22.4</td> | -22.4 |
| 88.797 | 12.75 | 7.9 | .6 | 21.2 | -- <td>V <td>-- <td>-22.4</td> </td></td> | V <td>-- <td>-22.4</td> </td> | -- <td>-22.4</td> | -22.4 |
| 127.20 | 8.35 | 12 | .7 | 21 | -- <td>V <td>-- <td>-22.3</td> </td></td> | V <td>-- <td>-22.3</td> </td> | -- <td>-22.3</td> | -22.3 |
| 137.63 | 4.05 | 12.6 | .7 | 17.3 | -- <td>V <td>-- <td>-22.5</td> </td></td> | V <td>-- <td>-22.5</td> </td> | -- <td>-22.5</td> | -22.5 |
| 149.99 | 4.85 | 12.6 | .7 | 18.2 | -- <td>V <td>-- <td>-26.2</td> </td></td> | V <td>-- <td>-26.2</td> </td> | -- <td>-26.2</td> | -26.2 |
| 152.7 | -17.8 | 12.7 | .7 | -4.4 | -- <td>V <td>-- <td>-25.3</td> </td></td> | V <td>-- <td>-25.3</td> </td> | -- <td>-25.3</td> | -25.3 |
| 167.99 | 1.05 | 13 | .7 | 14.8 | -- <td>V <td>-- <td>-47.9</td> </td></td> | V <td>-- <td>-47.9</td> </td> | -- <td>-47.9</td> | -47.9 |
| 192.00 | -2.55 | 13.7 | .8 | 11.9 | -- <td>V <td>-- <td>-31.6</td> </td></td> | V <td>-- <td>-31.6</td> </td> | -- <td>-31.6</td> | -31.6 |

| 30.036 | 10.8 | 13.8 | .4 | 25 | -- | V | -- | -15 |
|--------|-------|------|----|------|---|-------------------------------|-------------------|-------|
| 31.212 | 16.7 | 13.7 | .4 | 30.8 | -- <td>V <td>-- <td>-15</td> </td></td> | V <td>-- <td>-15</td> </td> | -- <td>-15</td> | -15 |
| 36.024 | 9.75 | 13.1 | .4 | 23.3 | -- <td>V <td>-- <td>-9.2</td> </td></td> | V <td>-- <td>-9.2</td> </td> | -- <td>-9.2</td> | -9.2 |
| 48.001 | 10.95 | 11.7 | .5 | 23.1 | -- <td>V <td>-- <td>-16.7</td> </td></td> | V <td>-- <td>-16.7</td> </td> | -- <td>-16.7</td> | -16.7 |
| 50.514 | 10 | 11.4 | .5 | 21.9 | -- <td>V <td>-- <td>-16.9</td> </td></td> | V <td>-- <td>-16.9</td> </td> | -- <td>-16.9</td> | -16.9 |
| 60.015 | 7.8 | 10.2 | .5 | 18.5 | -- <td>V <td>-- <td>-18.1</td> </td></td> | V <td>-- <td>-18.1</td> </td> | -- <td>-18.1</td> | -18.1 |
| 72.009 | 8.15 | 8.8 | .5 | 17.5 | -- <td>V <td>-- <td>-21.5</td> </td></td> | V <td>-- <td>-21.5</td> </td> | -- <td>-21.5</td> | -21.5 |
| 84.019 | 10.5 | 8.2 | .6 | 19.2 | -- <td>V <td>-- <td>-22.5</td> </td></td> | V <td>-- <td>-22.5</td> </td> | -- <td>-22.5</td> | -22.5 |
| 88.725 | 13.85 | 7.9 | .6 | 22.3 | -- <td>V <td>-- <td>-20.8</td> </td></td> | V <td>-- <td>-20.8</td> </td> | -- <td>-20.8</td> | -20.8 |
| 127.20 | 7.35 | 12 | .7 | 20 | -- <td>V <td>-- <td>-21.2</td> </td></td> | V <td>-- <td>-21.2</td> </td> | -- <td>-21.2</td> | -21.2 |
| 137.63 | 5.25 | 12.6 | .7 | 18.5 | -- <td>V <td>-- <td>-23.5</td> </td></td> | V <td>-- <td>-23.5</td> </td> | -- <td>-23.5</td> | -23.5 |
| 167.99 | 2.25 | 13 | .7 | 16 | -- <td>V <td>-- <td>-27.5</td> </td></td> | V <td>-- <td>-27.5</td> </td> | -- <td>-27.5</td> | -27.5 |
| 192.00 | -1.55 | 13.7 | .8 | 12.9 | -- <td>V <td>-- <td>-30.6</td> </td></td> | V <td>-- <td>-30.6</td> </td> | -- <td>-30.6</td> | -30.6 |

T U V P R O D U C T S E R V I C E

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 4
 Date 10/09/98 Page 5
 Engineer *[Signature]*
 Tech: DMK
 Requester *[Signature]*

 Frequency Level dbV db dbV/m dbV/m dbV/m
 Factor Cable Final Az Polar deg Height
 Delta FCC B Delta

180 degrees

| | | | | | | | | |
|--------|-------|------|----|------|----|---|----|-------|
| 30.036 | 11 | 13.8 | .4 | 25.2 | -- | V | -- | -14.8 |
| 31.212 | 16.35 | 13.7 | .4 | 30.4 | -- | V | -- | -9.6 |
| 36.024 | 10.7 | 13.1 | .4 | 24.2 | -- | V | -- | -15.8 |
| 48.001 | 10.3 | 11.7 | .5 | 22.5 | -- | V | -- | -17.5 |
| 50.496 | 9.15 | 11.4 | .5 | 21 | -- | V | -- | -19 |
| 60.015 | 7.35 | 10.2 | .5 | 18 | -- | V | -- | -22 |
| 72.009 | 7.5 | 8.8 | .5 | 16.8 | -- | V | -- | -23.2 |
| 84.019 | 10.6 | 8.2 | .6 | 19.3 | -- | V | -- | -20.7 |
| 88.803 | 11.6 | 7.9 | .6 | 20 | -- | V | -- | -23.5 |
| 127.20 | 8.5 | 12 | .7 | 21.2 | -- | V | -- | -22.3 |
| 137.63 | 5.6 | 12.6 | .7 | 18.8 | -- | V | -- | -24.7 |
| 167.99 | 1.4 | 13 | .7 | 15.2 | -- | V | -- | -28.3 |
| 192.00 | -.05 | 13.7 | .8 | 14.4 | -- | V | -- | -29.1 |

270 degrees

| | | | | | | | | |
|--------|-------|------|----|------|----|---|----|-------|
| 30.036 | 11.05 | 13.8 | .4 | 25.2 | -- | V | -- | -14.8 |
| 31.212 | 16.05 | 13.7 | .4 | 30.1 | -- | V | -- | -9.9 |
| 36.024 | 10.05 | 13.1 | .4 | 23.6 | -- | V | -- | -16.4 |
| 48.001 | 9.95 | 11.7 | .5 | 22.1 | -- | V | -- | -17.9 |
| 50.496 | 8.65 | 11.4 | .5 | 20.5 | -- | V | -- | -19.5 |
| 60.015 | 9.05 | 10.2 | .5 | 19.7 | -- | V | -- | -20.3 |
| 72.009 | 7.8 | 8.8 | .5 | 17.1 | -- | V | -- | -22.9 |
| 84.019 | 9.55 | 8.2 | .6 | 18.3 | -- | V | -- | -21.7 |
| 127.20 | 7.1 | 12 | .7 | 19.8 | -- | V | -- | -23.7 |
| 137.63 | 6.1 | 12.6 | .7 | 19.3 | -- | V | -- | -24.2 |
| 192.00 | .2 | 13.7 | .8 | 14.7 | -- | V | -- | -28.8 |
| 120.03 | 4.15 | 11.5 | .6 | 16.3 | -- | V | -- | -27.2 |

Maximized emissions, Vertical, from 30-200 MHZ
 31.227 22.7 13.7 .4 36.8 -- V -- -3.2
 The above reading is maximized at 2 degrees, 1 meter, Vert.
 Changing to Horizontal.
 31.227 9.8 13.7 .4 23.9 -- H -- -16.1
 36.024 2.5 13.1 .4 16 -- H -- -24

TUV PRODUCT SERVICE

RADIATED EMISSIONS

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Report B8479 Run 4
 Date 10/09/98 Page 6
 Engineer RWJG
 Tech: DMK
 Requester

Frequency Level Factor Cable Final Az Polar \ deg Height FCC B Delta
 MHz dBV dB dBV/m deg Height FCC B Delta

| | | | | | | | | |
|--------|------|------|----|------|----|---|----|-------|
| 48.001 | 4.2 | 11.7 | .5 | 16.4 | -- | H | -- | -23.6 |
| 84.019 | 7.05 | 8.2 | .6 | 15.8 | -- | H | -- | -24.2 |
| 88.833 | 11.2 | 7.9 | .6 | 19.6 | -- | H | -- | -23.9 |
| 120.03 | 5.95 | 11.5 | .6 | 18.1 | -- | H | -- | -25.4 |
| 137.63 | 3.6 | 12.6 | .7 | 16.8 | -- | H | -- | -26.7 |

| | | | | | | | | |
|------------|-----|------|----|------|----|---|----|-------|
| 90 degrees | | | | | | | | |
| 31.227 | 10 | 13.7 | .4 | 24.1 | -- | H | -- | -15.9 |
| 88.809 | 13 | 7.9 | .6 | 21.4 | -- | H | -- | -22.1 |
| 167.99 | 2.3 | 13 | .7 | 16.1 | -- | H | -- | -27.4 |

| | | | | | | | | |
|-------------|-------|------|----|------|----|---|----|-------|
| 180 degrees | | | | | | | | |
| 30.036 | 2.4 | 13.8 | .4 | 16.6 | -- | H | -- | -23.4 |
| 31.227 | 9.45 | 13.7 | .4 | 23.5 | -- | H | -- | -16.5 |
| 48.001 | 7.5 | 11.7 | .5 | 19.7 | -- | H | -- | -20.3 |
| 88.821 | 13.45 | 7.9 | .6 | 21.9 | -- | H | -- | -21.6 |
| 120.03 | 4.25 | 11.5 | .6 | 16.4 | -- | H | -- | -27.1 |
| 192.00 | .25 | 13.7 | .8 | 14.7 | -- | H | -- | -28.8 |

| | | | | | | | | |
|-------------|-------|------|----|------|----|---|----|-------|
| 270 degrees | | | | | | | | |
| 30.036 | 2.5 | 13.8 | .4 | 16.7 | -- | H | -- | -23.3 |
| 31.227 | 12.15 | 13.7 | .4 | 26.2 | -- | H | -- | -13.8 |
| 36.024 | 2.6 | 13.1 | .4 | 16.1 | -- | H | -- | -23.9 |
| 50.496 | 2.4 | 11.4 | .5 | 14.3 | -- | H | -- | -25.7 |
| 60.015 | 5.45 | 10.2 | .5 | 16.1 | -- | H | -- | -23.9 |
| 88.803 | 11 | 7.9 | .6 | 19.4 | -- | H | -- | -24.1 |
| 120.03 | 5.2 | 11.5 | .6 | 17.3 | -- | H | -- | -26.2 |
| 137.72 | 7.85 | 12.6 | .7 | 21.1 | -- | H | -- | -22.4 |

Maximized emissions, Horizontal, from 30-200 MHz

31.227 15.45 13.7 .4 29.5 -- H --
 The above reading is max at 298 degrees, 3 meters. Horiz. -10.5

RADIATED EMISSIONS

Figure

Report B8479 Run 4
 Date 10/09/98 Page 8
 Engineer *[Signature]*
 Tech: DMK
 Requester *[Signature]*

PW1 Test Site
 3 Meter Antenna Distance
 Equipment Under Test:
 Inovonics Corp. M/N: 3MB3
 Cordless Base Transceiver
 Notes: S/N: 1, 12 Vdc

Measurement Summary

| Frequency | Final | Azimuth | Polar | Delta B | Delta |
|-----------|--------|---------|--------|---------|-------|
| MHz | dBuV/m | deg | Height | FCC B | Delta |

| | | | | | |
|--------|------|--------|---|-------|--|
| 30.036 | 25.2 | 18.197 | V | -14.8 | |
| 31.227 | 36.8 | 69.183 | V | -3.2 | |
| 36.024 | 24.2 | 16.218 | V | -15.8 | |
| 48.001 | 23.1 | 14.288 | V | -16.9 | |
| 50.496 | 24.3 | 16.405 | V | -15.7 | |
| 60.015 | 19.7 | 9.6605 | V | -20.3 | |
| 72.009 | 17.6 | 7.5857 | V | -22.4 | |
| 84.019 | 19.3 | 9.2257 | V | -20.7 | |
| 88.725 | 22.3 | 13.031 | V | -21.2 | |
| 120.03 | 18.1 | 8.0352 | H | -25.4 | |
| 127.20 | 21.2 | 11.481 | V | -22.3 | |
| 137.72 | 21.1 | 11.350 | H | -22.4 | |
| 149.99 | 18.2 | 8.1283 | V | -25.3 | |
| 152.7 | -4.4 | .60255 | V | -47.9 | |
| 167.99 | 16.1 | 6.3826 | H | -27.4 | |
| 192.00 | 14.7 | 5.4325 | V | -28.8 | |
| 740.24 | 31.9 | 39.355 | V | -14.1 | |
| 744.59 | 31.9 | 39.355 | V | -14.1 | |
| 744.83 | 30.4 | 33.113 | H | -15.6 | |
| 1480.4 | 33.9 | 49.545 | H | -20.1 | |
| 1489.6 | 31.9 | 39.355 | H | -22.1 | |
| 2234.4 | 25.4 | 18.620 | V | -26.5 | |
| 2960.9 | 29.5 | 29.853 | H | -28.6 | |
| 2979.2 | 29.2 | 28.840 | V | -24.5 | |
| 3701.2 | 32.7 | 43.151 | V | -24.8 | |
| 3724.0 | 39.1 | 90.157 | V | -21.3 | |
| 4441.4 | 32.3 | 41.209 | V | -21.7 | |
| 4468.8 | 32.2 | 40.738 | V | -21.8 | |

File B8479 Run 4

Minimum Passing Margin for FCC B Is 3.2 dB at 31.227 MHz

TUV PRODUCT SERVICE

Figure

NARROWBAND CONDUCTED EMISSIONS
INOVONICS CORP. M/N: 3MB3 CORDLESS BASE TRANSCIEIVER
S/N: 1, 12 VDC

Report: B8479

Date: 09-OCT-98

Engineer: JCL

Tech

Run 4
Page 1

Measurement Summary

| Frequency (MHZ) | Amplitude (dBuV) | FCC CLASS B DELTA |
|-----------------|------------------|-------------------|
| 0.450 | 18.0 | -30.0 |
| 0.500 | 21.0 | -27.0 |
| 7.20 | 12.0 | -36.0 |
| 12.00 | 25.0 | -23.0 |
| 16.00 | 23.0 | -25.0 |
| 26.30 | 31.0 | -17.0 |

Minimum Passing Margin for FCC CLASS B is 17 dB at 26.2 MHz
File B8479 Run 4

Constructional Data Form

and

Test Plan

Appendix C



Test Plan for Electromagnetic Compatibility Testing

General Information (if you need assistance completing this form contact your TÜV Product Service representative.)

Company: INOVONICS CORP. Quote Number: _____

Contact: Amy Arguelles Phone: (business hrs) 303-939-9336 x167

E-mail Address: _____ Phone: (after hrs) _____

Product Description

Description: Transceiver Module

Model Number: 3MB3 Serial Number: 1

Test Objective

EMC Directive 89/336/EEC (EMC)

Machinery Directive 89/392/EEC (EMC)

Medical Device Directive 93/42/EEC (EMC)

FCC15.249 Part _____ (list)

Vehicle Directive 72/245/EEC (EMC)

FDA Reviewers Guidance for Premarket Notification Submissions (EMC)

Other _____ (list)

Attendance

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

Failure

If a failure occurs, TÜV Product Service should:

Call contact listed above, if not available then stop testing.

Continue testing to complete test series.

Continue testing to define corrective action.

Stop testing.

Authorization

Customer authorization to perform tests according to this test plan.

[Signature] Date: 10/19/98

Amy Arguelles Test Plan Prepared By (please print) Date: 10/05/98

Reviewed by TÜV Product Service Associate [Signature] Date: 11/6/98



Test Plan for Electromagnetic Compatibility Testing

Equipment Under Test Transportation

- Transportation between sites by customer.
- Other (consult your TÜV Product Service representative)

Dimensions and Weight

Length _____
 Width _____
 Height _____
 Weight _____

Facilities

- Power Requirements**
- 230 VAC 50 Hz Single Phase
 - 400 VAC 50 Hz Three Phase
 - 120 VAC 60 Hz Single Phase
 - 208 VAC 60 Hz Three Phase
 - 12 VDC
 - VDC
 - Battery
 - Other
- _____ Amps per phase
 _____ Amps per phase
 _____ Amps per phase
 _____ Amps per phase
- _____ Expected life
 _____ hours

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)

- Other**
- Air _____ cfm
 - Other _____ psi
 - Water _____ gpm
- (describe) _____ psi

Test Plan Attachments

- Constructional Data Form (CDF) Applicable (attached)
 - Immunity Test Plan Details Applicable (attached)
 - Emissions Test Plan Details Applicable (attached)
 - On Site Test Plan Details Applicable (attached)
 - N/A
 - N/A
 - N/A
- * The CDF is required for all test plans.

Constructional Data Form for Electromagnetic Compatibility Testing



A completed form helps ensure that product testing will go smoothly. Add attachments as necessary for additional documentation. For additional help, please contact your TUV Product Service Representative.

Applicant -- Enter company information pertaining to the location where the product is manufactured and for the manufacturer's contact soliciting the testing.

Company: Inovonics Corporation

Address: 2100 Central Ave
Boulder, Colorado 80301

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

Contact: Amy Arguehles x167
Position: Exec. Admin. Asst.

General Equipment Description -- Indicate which attachments you are providing with this document. It is recommended that you provide those listed.

Type of Equipment: Transceiver Module
Model No.: 3MB3
FCC ID No.: HCQ3B63MB3

Serial No.: N/A
General description: cordless base transceiver

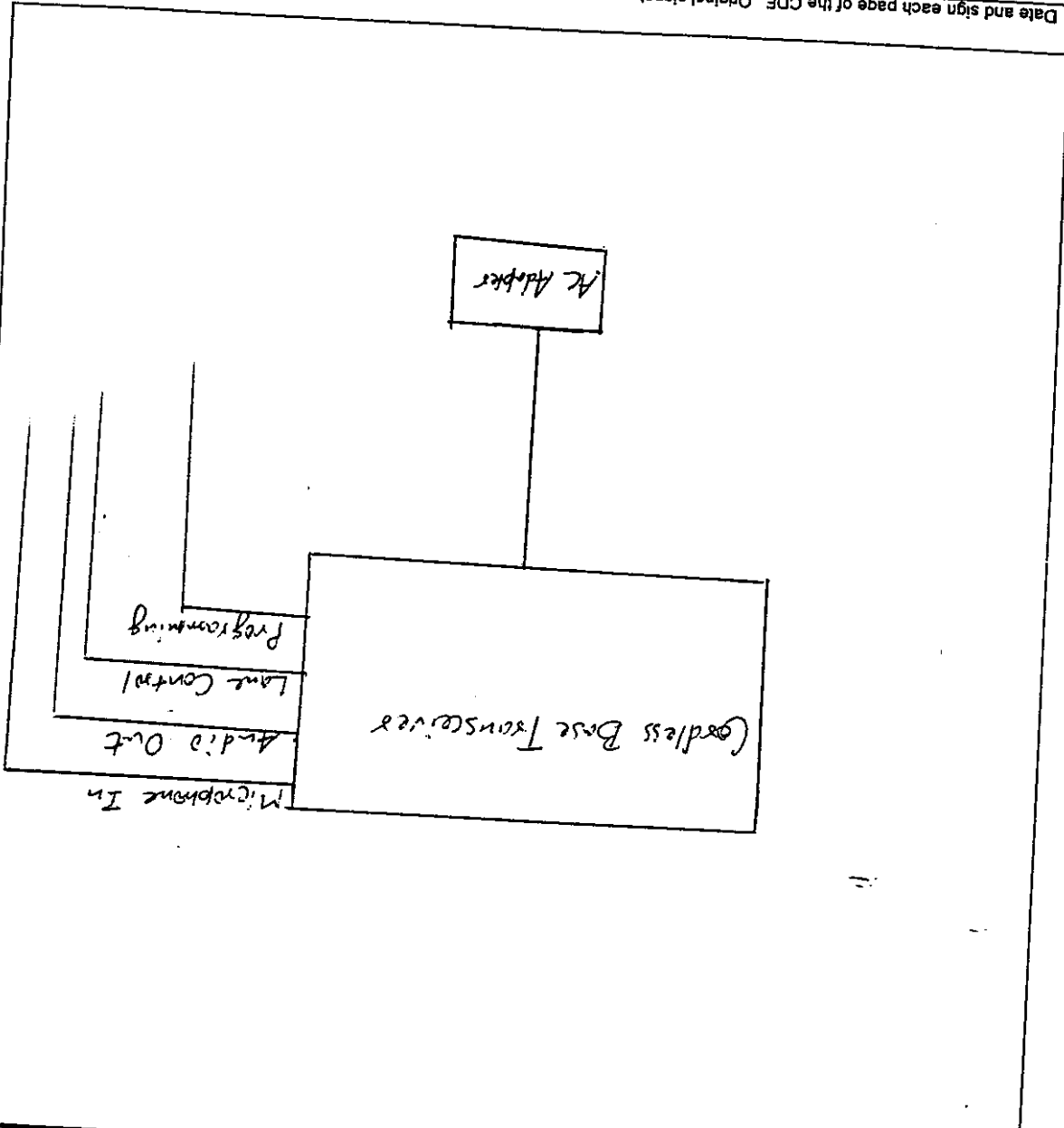
Attachments: (only required for certification)

External Photographs Product Literature High Level Bill of Materials

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
Signature of Applicant: *[Signature]*

Date: _____
Signature of Applicant: _____
Date and sign each page of the CDF. Original signatures must be present on each page.



System Configuration Block Diagram - Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.

Constructural Data Form for Electromagnetic Compatibility Testing



Constructional Data Form for Electromagnetic Compatibility Testing



Installation and Environmental Conditions (describe) -- Describe the intended installation. Include details such as power connection and system grounding approaches. Describe the intended operating environment, include details such as humidity, cooling, heating and hazardous environments. Attaching a copy of an installation manual is recommended for proper documentation of your system. Please indicate:

Installation manual/instructions (attached, only required for certification)

Power Requirements -- Indicate your system power requirements for the equipment to be tested.

Rated Voltage _____
Rated Input Power _____

Protection Class -- Indicate your product's protection class. Contact your TÜV Product Service representative and is only required for certification.

Type: _____
Class: _____

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
Signature of Applicant: _____

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Author: B. DR
Revised: 20 March 1997

Constructional Data Form for Electromagnetic Compatibility Testing



I/O Ports and Cables
 Indicate all interface cables which can be attached to the equipment even if they are not sold as part of your system. Describe the port (e.g., Parallel, Serial, SCSI), list its type (e.g., AC, DC, Signal, Control) and number of ports/cables of type. Indicate if the I/O port is to be exercised during testing. List the type of transmission and if the cable is an EUT assembly-to-assembly interconnection cable (PC to printer, to modem). Indicate whether the cable is shielded or not, type of shield (e.g., Braid, Foil) and how terminated (e.g., 360 degree to conductive shell, pigtail) at both ends of the cable. If a cable can have a typical length of ≥ 3.0 meters, then it is required to test with a cable of at least 3.0 meters.

I/O Ports and Cables
 Description: Microphone In

Type of Port: _____

Exercised during testing? Yes No

Assembly \leftrightarrow Assembly Interconnect Yes No

Cable shielded: Yes No

Shield Type (describe): _____

Termination: (describe) _____

Transmission Type: _____

Length of cable: _____

Maximum: _____

Tested: Analog Digital 8 ft

of ports/cables of type _____

I/O Ports and Cables
 Description: Audio Out

Type of Port: _____

Exercised during testing? Yes No

Assembly \leftrightarrow Assembly Interconnect Yes No

Cable shielded: Yes No

Shield Type (describe): _____

Termination: (describe) _____

Transmission Type: _____

Length of cable: _____

Maximum: _____

Tested: Analog Digital 8 ft

of ports/cables of type _____

I/O Ports and Cables
 Description: Line Control

Type of Port: _____

Exercised during testing? Yes No

Assembly \leftrightarrow Assembly Interconnect Yes No

Cable shielded: Yes No

Shield Type (describe): _____

Termination: (describe) _____

Transmission Type: _____

Length of cable: _____

Maximum: _____

Tested: Analog Digital 8 ft

of ports/cables of type _____

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
 Signature of Applicant: _____

Constructional Data Form for Electromagnetic Compatibility Testing



I/O Ports and Cables
 Indicate all interface cables which can be attached to the equipment even if they are not sold as part of your system. Describe the port (e.g., Parallel, Serial, SCSI), list its type (e.g., AC, DC, Signal, Control) and number of ports/cables of type. Indicate if the I/O port is to be exercised during testing. List the type of transmission and if the cable is an EUT assembly-to-assembly interconnection cable (PC to printer, to modem). Indicate whether the cable is shielded or not, type of shield (e.g., Braid, Foil) and how terminated (e.g., 360 degree to conductive shell, pigtail) at both ends of the cable. If a cable can have a typical length of ≥ 3.0 meters, then it is required to test with a cable of at least 3.0 meters.

I/O Ports and Cables

description: Reprogramming

type of Port: _____

exercised during testing? Yes No

assembly ↔ Assembly Interconnect Yes No

able shielded: Yes No

shield Type (describe): _____

termination: (describe) _____

transmission Type: _____

length of cable: _____

Maximum: _____

Tested: Analog Digital 4 ft

of ports/cables of type: _____

I/O Ports and Cables

description: _____

type of Port: _____

exercised during testing? Yes No

assembly ↔ Assembly Interconnect Yes No

able shielded: Yes No

shield Type (describe): _____

termination: (describe) _____

transmission Type: _____

length of cable: _____

Maximum: _____

Tested: Analog Digital

of ports/cables of type: _____

I/O Ports and Cables

description: _____

type of Port: _____

exercised during testing? Yes No

assembly ↔ Assembly Interconnect Yes No

able shielded: Yes No

shield Type (describe): _____

termination: (describe) _____

transmission Type: _____

length of cable: _____

Maximum: _____

Tested: Analog Digital

of ports/cables of type: _____

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
 Signature of Applicant: _____

Constructional Data Form for Electromagnetic Compatibility Testing



EUT configurations -- Provide a technical description of all possible EUT configurations. Specify if more than one configuration is to be tested.

Test Condition Techn: CMI Information

Mode of Operation: Analog, FM

Number of channels: 16

Frequency Control: Frequency synthesizer

Modulation Method: FM

Antenna type: Monopole

EUT Software and Operation 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. Consult with your TUV Product Service Representative when typical operating modes are not practical. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. This pattern must be sent to the parallel port device, serial port device, and must be write/read/verified to each storage device. Monitors must display the H pattern, typically in white letters on a black background. 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.

General Description:
(describe)

Software Revision Level:
(list and describe)

Transmitting and receiving simultaneously

Operating modes to be tested: (list and describe)

Operation manual/instructions (attached)

Date and sign each page of the CDF. Original signatures must be present on each page.

Date:

Signature of Applicant:

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Author: B. Dill
Revised: 20 March 1997

Constructional Data Form for Electromagnetic Compatibility Testing



System, Subsystem, Major Subassemblies or Internal Peripherals -- List and describe all system, subsystem, major subassemblies and all internal peripherals. This should include such things as an external monitor, parallel interface peripheral, serial interface peripheral, internal disk drives or internal circuit boards. It is recommended that circuit diagrams, assembly and subassembly drawings be attached. Please indicate.

| Description | Model # | Serial # | FCC ID # |
|-------------|---------|----------|----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Technical Drawings attached

Interfacing Equipment and/or Simulators (which are not part of the EUT) -- List and Describe all equipment or peripherals that will be connected to the EUT. For FCC testing a minimum configuration is required. If you have questions about this minimum configuration contact your TÜV Product Service representative.

| Description | Model # | Serial # | FCC ID # |
|-------------|---------|----------|----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
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| | | | |
| | | | |
| | | | |

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
Signature of Applicant: _____

Constructural Data Form for Electromagnetic Compatibility Testing

EMC System Details -- List all frequencies and sub-harmonics which are 10kHz or above for such things as oscillators, horizontal line rate of monitors, and clock rates of incorporated OEM assemblies. List all power supplies. Indicate switching frequencies. List power line filters and indicate the manufacturer, model and location on EUT. Indicate all components used for high frequency noise reduction. (e.g., ceramic capacitor, 0.01µF, 1 ea. at C12 - C20).

| Oscillator Frequencies | | | Sub-harmonics | | EUT Location | Description of Use |
|--|-----------------|-----------------|-----------------|-----------------------|--------------|--------------------|
| Frequency | 920.26 → 924.82 | N/A | | | | Transmitter |
| | 744.24 → 744.80 | N/A | | | | First L.O. |
| | 152.70 | N/A | | | | Second L.O. |
| Power Supply | | | | | | |
| Frequency | Manufacturer | Model # | Serial # | Type (list frequency) | | |
| | Helio Direct | 1272 | 04945 | +12V DC | | |
| Power Line Filters | | | | | | |
| Manufacturer | Model # | Qty | Location on EUT | | | |
| | | | | | | |
| Critical EMI Components (Capacitors, ferrites, etc.) | | | | | | |
| Description | Manufacturer | Part # or Value | Qty | Location on EUT | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
 Signature of Applicant: *[Signature]*

Constructional Data Form for Electromagnetic Compatibility Testing



Other EMI Critical Construction Detail -- Indicate any other measures taken to reduce high frequency noise, (e.g., grounding the circuit board on the right rear corner with 0.25" braid, 3 inches long to the chassis).

[Empty box for Other EMI Critical Construction Detail]

Description of Enclosure -- Describe the principle materials of the enclosure (e.g., plastic, plastic with shielding material, metal, metal with specific shielding contact points, metal with paint on all surfaces).

Plastic

[Empty box for Description of Enclosure]

Date and sign each page of the CDF. Original signatures must be present on each page.

Date: _____
Signature of Applicant: _____

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Author: B. Dill
Revised: 20 March 1997

Measurement of Protocol

Appendix D

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) | 32.21 | | | | | | |
| Level (dB μ V) | 13.9 | + | 16.3 | = | 30.2 | - | 40.0 |
| | | | Factor & | | Final | | FCC B |
| | | | Cable (dB) | = | (dB μ V/m) | - | Limit (dB μ V/m) |
| | | | | | | | = |
| | | | | | | | Delta |
| | | | | | | | (dB) |
| | | | | | | | FCC B |
| | | | | | | | = |
| | | | | | | | -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 9248.2 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 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 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.

Test Set-up Photographs

Appendix E