



PRODUCT SERVICE

NVLAP

EMC EMISSION - TEST REPORT

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

Test End Date

09 October 1998

Test Report Project No.

B241847901

Total Pages including

41

Appendices

Reviewed By : Felix J. Chavez

Reviewed By : Shawn Singh

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EMISSIONS TEST REGULATIONS :

The tests were performed according to following regulations :

- - Federal Communication Commission part 15
- - 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: B8479

Date: 09 Oct 98

Signature: Shawn S. J. J.

Atmo. Pressure: 81 kPa

Temp: 23.2 Rel. Humid.: 26%

Location Tests Manufacturer Model Number Serial Number Description

PW	R	AH Systems	SAS-200/510	705	Log Periodic Antenna (300-1800 MHz)	06-Jun-98	18-Nov-98
PW	R	AH Systems	SAS-200/512	104	Log Periodic Antenna (200-1500 MHz)	13-Jun-98	18-Nov-98
PW	R	AH Systems	SAS-200/542	256	Biconical Antenna	03-Feb-98	18-Nov-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	Melting Unit		
PW	R	California Instr.	850T-1	68458	Oscillator (45-5000 Hz)	08-Mar-98	18-Nov-98
PW	R	California Instr.	9000TCA/3-1	60666+	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	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	3886	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	USN	15-Jul-98	15-Jul-99
PW	R	EMCO	3825/2	9202-1946	USN	08-Jul-97	08-Jul-98
PW	R	EMCO	3825/2	9202-1946	USN	23-Jul-98	23-Jul-99
PW	R	EMCO	4610	9206-1199	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	356	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	Allimeter		
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-97	18-Nov-98
PW	R	Hewlett Packard	11947A	3107A01975	Transient Limiter	17-Jun-98	17-Jun-99
PW	R	Hewlett Packard	8444A	2325A07399	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	2043A00256	Quasi Peak Adapter (set 1)	17-Jun-95	17-Jun-96
PW	R	Hewlett Packard	85650A	2817A01300	Quasi Peak Adapter	18-Nov-97	18-Nov-98
PW	R	Hewlett Packard	85662A	2112A02220	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 (loaner)	20-Nov-97	20-Nov-98
PW	R	Hewlett Packard	85662A	2403A08749	Display Section	01-Apr-98	01-Apr-99
PW	R	Hewlett Packard	85668	2410A00154	Spectrum Analyzer (dc-22 GHz)	01-Apr-98	01-Apr-99

Location	Tests	Manufacturer	Model Number	Serial Number	Description	Cal Date
PW	R, C	Hewlett Packard	8566B	2410A00254	Spectrum Analyzer (Loaner)	20-Nov-97
PW	R, C, RE101, CISP	Hewlett Packard	8566B	2304A02508	Spectrum Analyzer (set 1) (dc-1.8 GHz)	17-Jun-98
PW		Hewlett Packard	8590	2722A02036	Spectrum Analyzer	21-Nov-97
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	0020698-14	RF Pre-Amplifier (10-4200 MHz)	13-Feb-98
PW	R	Mini-Circuits	ZHL-1042J	N032898	RF Pre-Amplifier (30-4000 MHz)	11-May-98
PW	C	Polaroid Electronics	ESH3-ZZ	357.881J.32	Transient Limiter	
PW	X	Radio Shack	63-867	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)	06-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	8129126	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	Ridged 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	DM5XL	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

Date: 9-Oct-98
 EUT: 3MB3
 Customer: Donald J. Hume

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

TUV PRODUCT SERVICE INC

Tx Mode: Radiated Measurements

Fundamental Field Strength
 Specification
 93.9 dBuV/m

Peak
 Measurement
 dBuV/m @ MHz
 91.0 920.3 -2.9

40 Meadow Road

Harmonics

Range
 Specification

Peak
 Measurement
 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	6441.6	-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	-6.6
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

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

RADIATED EMISSIONS

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

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

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	--	--	--	--	--

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 *FLK*
Tech: S S *Shawn S. Mfg*
Requester

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

High channel.

8282.1	2.35	38.3	6	46.7	--	H	--	H	--	51	--	--
9202.3	4.55	40.2	6.3	51	--	H	--	H	--	47.3	--	--
9202.3	4.45	40.2	6.3	50.9	--	V	--	V	--	47.3	--	--
8282.1	3	38.3	6	47.3	--	V	--	V	--	47.3	--	--

Disregard above four readings with high channel.

105 deg/1.1 m

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

40 deg/1 m

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

4624.0	6.95	34.1	4.8	45.9	--	H	--	H	--	42.9	--	--
5548.9	1.4	36.3	5.2	42.9	--	H	--	H	--	42.9	--	--
6473.7	.8	36.3	5.5	42.6	--	H	--	H	--	42.6	--	--
7398.5	-.9	38	5.7	42.9	--	H	--	H	--	42.9	--	--

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

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	--	44.4	--	--
2774.4	7.35	31.1	3.6	42.1	--	V	--	V	--	42.1	--	--
3699.2	6.9	33.4	4.1	44.4	--	V	--	V	--	44.4	--	--

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 *ELC JAG*
Tech: S S *Shaw S. mgt*
Requester

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

3699.2	6.6	33.4	4.1	44.1	--	H	--
2774.4	4.85	31.1	3.6	39.6	--	H	--
1849.6	13.5	28.4	2.8	44.7	--	H	--

TUV PRODUCT SERVICE

RADIATED EMISSIONS

Figure

Report B8479 Run 2
Date 10/09/98 Page 4
Engineer *FL 398*
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	Final	dBuV/m	uV/m	Azimuth	Polar	Delta	Delta
-----------	-------	--------	------	---------	-------	-------	-------

920.27	91.2	36307.	36307.	--	H	--	--
1840.5	44.4	165.95	165.95	--	V	--	--
1849.6	44.7	171.79	171.79	--	H	--	--
2760.7	46.8	218.77	218.77	--	V	--	--
2774.4	42.1	127.35	127.35	--	V	--	--
3680.9	47	223.87	223.87	--	V	--	--
3699.2	44.4	165.95	165.95	--	V	--	--
4601.2	48.3	260.01	260.01	--	V	--	--
4624.0	46.8	218.77	218.77	--	V	--	--
5521.4	44.2	162.18	162.18	--	V	--	--
5548.9	42.9	139.63	139.63	--	H	--	--
6441.6	44.8	173.78	173.78	--	V	--	--
6473.7	42.6	134.89	134.89	--	H	--	--
7361.8	45.8	194.98	194.98	--	V	--	--
7398.5	42.9	139.63	139.63	--	H	--	--
8282.1	47.4	234.42	234.42	--	V	--	--
8323.3	47.1	226.46	226.46	--	H	--	--
9202.3	51.2	363.07	363.07	--	V	--	--
9248.2	50.3	327.34	327.34	--	H	--	--

File B8479 Run 2

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 3
 Date 10/09/98 Page 1
 Engineer *FL 108*
 Tech: S S *Smith S. Mgr*
 Requester

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

Continuation of RUN 2.

Log periodic antenna

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

TUV PRODUCT SERVICE

RADIATED EMISSIONS

Figure

Report B8479 Run 3
Date 10/09/98 Page 2
Engineer ELK & S.
Tech: S S Shuman S. MGL
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
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	deg	Height	FCC B	Delta
MHz	dBuV	dB	dB	dBuV/m						

30 - 5000 MHz.

Investigating incorporated digital circuitry, receiver L.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 *[Signature]*

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

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										

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 3
Engineer *[Signature]*
Tech: DMK
Requester

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

3724.0 -5	33.5	4.2	32.6	--	H	--	-21.4	
The above reading is the noise floor								
4468.8 -6.85	33.8	4.7	31.7	--	H	--	-22.3	

Changing to Vertical.

1489.6 1.35	27	2.5	30.8	--	V	--	-23.2	
320 degrees, 1.4 meters, Vertical								
2234.4 -8.05	29.8	3.2	24.9	--	V	--	-29.1	
noise floor								
2979.2 -6.1	31.5	3.8	29.2	--	V	--	-24.8	
noise floor								
3724.0 1.45	33.5	4.2	39.1	--	V	--	-14.9	
150 deg. 1.4 meters								
4468.8 -6.35	33.8	4.7	32.2	--	V	--	-21.8	
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

Report B8479 Run 4
Date 10/09/98 Page 4
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

Frequency Level	dBV	dB	Factor Cable	dB	Final	dBV/m	Az	Polar	FCC B	Delta
MHz	dBV	dB								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	-31.6
31.212	16.2	13.7	.4	30.3	--	V	--	--	-9.7	-16.1
36.024	10.35	13.1	.4	23.9	--	V	--	--	-17.4	-15.7
47.953	10.45	11.7	.5	22.6	--	V	--	--	-22.3	-16.1
50.496	12.4	11.4	.5	24.3	--	V	--	--	-17.4	-15.7
60.015	7	10.2	.5	17.7	--	V	--	--	-22.3	-15.7
72.009	8.25	8.8	.5	17.6	--	V	--	--	-22.4	-22.3
84.019	8.85	8.2	.6	17.6	--	V	--	--	-22.4	-22.4
88.797	12.75	7.9	.6	21.2	--	V	--	--	-22.4	-22.4
127.20	8.35	12	.7	21	--	V	--	--	-22.3	-22.3
137.63	4.05	12.6	.7	17.3	--	V	--	--	-22.5	-22.5
149.99	4.85	12.6	.7	18.2	--	V	--	--	-26.2	-26.2
152.7	-17.8	12.7	.7	-4.4	--	V	--	--	-25.3	-25.3
167.99	1.05	13	.7	14.8	--	V	--	--	-28.7	-28.7
192.00	-2.55	13.7	.8	11.9	--	V	--	--	-31.6	-31.6

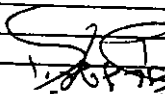
90 degrees

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

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 5
Engineer: 
Tech: DMK
Requester: _____

Frequency Level	dB	dB	dB	dB	Az Polar \	deg Height	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 RWJQC
Tech: DMK
Requester

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

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

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

TVV 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

Notes: S/N: 1, 12 Vdc

INOVONICS Corp. M/N: 3MB3
Cordless Base Transceiver
Notes: S/N: 1 10 11

Equipment Under Test:

3 Meter Antenn
Equipment Incls

PW1 Test Site

Requester

Tech: DMK

Engineer

Report B8
Date 10/01

Report B8

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

[illegible]

MHz	dBuV	dB	dB	dBuV/m	Az Polar/ deg Height
14.1	10	-10	-10	10	10
14.2	10	-10	-10	10	10
14.3	10	-10	-10	10	10
14.4	10	-10	-10	10	10
14.5	10	-10	-10	10	10
14.6	10	-10	-10	10	10
14.7	10	-10	-10	10	10
14.8	10	-10	-10	10	10
14.9	10	-10	-10	10	10
15.0	10	-10	-10	10	10
15.1	10	-10	-10	10	10
15.2	10	-10	-10	10	10
15.3	10	-10	-10	10	10
15.4	10	-10	-10	10	10
15.5	10	-10	-10	10	10
15.6	10	-10	-10	10	10
15.7	10	-10	-10	10	10
15.8	10	-10	-10	10	10
15.9	10	-10	-10	10	10
16.0	10	-10	-10	10	10
16.1	10	-10	-10	10	10
16.2	10	-10	-10	10	10
16.3	10	-10	-10	10	10
16.4	10	-10	-10	10	10
16.5	10	-10	-10	10	10
16.6	10	-10	-10	10	10
16.7	10	-10	-10	10	10
16.8	10	-10	-10	10	10
16.9	10	-10	-10	10	10
17.0	10	-10	-10	10	10
17.1	10	-10	-10	10	10
17.2	10	-10	-10	10	10
17.3	10	-10	-10	10	10
17.4	10	-10	-10	10	10
17.5	10	-10	-10	10	10
17.6	10	-10	-10	10	10
17.7	10	-10	-10	10	10
17.8	10	-10	-10	10	10
17.9	10	-10	-10	10	10
18.0	10	-10	-10	10	10
18.1	10	-10	-10	10	10
18.2	10	-10	-10	10	10
18.3	10	-10	-10	10	10
18.4	10	-10	-10	10	10
18.5	10	-10	-10	10	10
18.6	10	-10	-10	10	10
18.7	10	-10	-10	10	10
18.8	10	-10	-10	10	10
18.9	10	-10	-10	10	10
19.0	10	-10	-10	10	10
19.1	10	-10	-10	10	10
19.2	10	-10	-10	10	10
19.3	10	-10	-10	10	10
19.4	10	-10	-10	10	10
19.5	10	-10	-10	10	10
19.6	10	-10	-10	10	10
19.7	10	-10	-10	10	10
19.8	10	-10	-10	10	10
19.9	10	-10	-10	10	10
20.0	10	-10	-10	10	10
20.1	10	-10	-10	10	10
20.2	10	-10	-10	10	10
20.3	10	-10	-10	10	10
20.4	10	-10	-10	10	10
20.5	10	-10	-10	10	10
20.6	10	-10	-10	10	10
20.7	10	-10	-10	10	10
20.8	10	-10	-10	10	10
20.9	10	-10	-10	10	10
21.0	10	-10	-10	10	10
21.1	10	-10			

MHz	dBuV	dB	dBuV/m	AZ Polarity	deg Height	Delta FCC B
-----	------	----	--------	-------------	------------	-------------

Delta

Changing to the Log Periodic Antenna, Vertical polarization. 0 degrees

NO EMISSIONS DETECTED

06 06

NO EMISSIONS

180 degrees

NO. 155

270 degrees
No emissions

Changing to Horizontal.

seeber c

ON THE SUBJECTS

degrees of
emissions

degrees 08
of emissions

70 degrees
0 emissions.

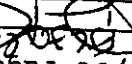
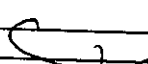
ND OF RUN

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TUV PRODUCT SERVICE

RADIATED EMISSIONS

Figure

Report B8479 Run 4
Date 10/09/98 Page 8
Engineer 
Tech: DMK
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	--- uV/m	Azimuth deg	Polar Height	Delta 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
240.24	31.9	39.355	--	V	--	-14.1
244.59	28.7	27.227	--	V	--	-17.3
244.83	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
2220.7	27.5	23.713	--	V	--	-26.5
2234.4	25.4	18.620	--	H	--	-28.6
2960.9	29.5	29.853	--	V	--	-24.5
2979.2	29.2	28.840	--	V	--	-24.8
3701.2	32.7	43.151	--	V	--	-21.3
3724.0	39.1	90.157	--	V	--	-14.9
4441.4	32.3	41.209	--	V	--	-21.7
4468.8	32.2	40.738	--	V	--	-21.8

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

File B8479 Run 4

A

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: JLC/40

Tech

Run 4
 Page 1

Measurement Summary
 DELTA
 FCC
 CLASS B

Frequency (MHz)	Amplitude (dBuV)	DELTA FCC CLASS B
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

Appendix C

Test Plan

and

Constructional Data Form

Test Plan

for Electromagnetic Compatibility Testing



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

Company:

INOVONICS CORP.

Contact:

Army Arguelles

E-mail Address:

Phone: (after hrs)

Phone: (business hrs) 303-939-9336 x167

Quote Number:

Product Description

Description:

Transceiver Module

Model Number:

3MB 3

Serial Number:

1

Test Objective

- ☐ EMC Directive 89/336/EEC (EMC)
☐ Machinery Directive 89/392/EEC (EMC)
☐ Medical Device Directive 93/42/EEC (EMC)
☒ FCC 15.249 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, TUV 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.

Army Arguelles

Test Plan Prepared By (please print)

Reviewed by TUV Product Service Associate

Date

11/6/98

Date

10/05/98

Date

10/9/98

P. 03/03

FAX NO. 303 449 3004

OCT-02-98 FRI 03:29 PM TUV PRODUCT SERVICE



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
☐ 400 VAC 50 Hz
☐ 120 VAC 60 Hz
☐ 208 VAC 60 Hz
☒ 12 VDC
☐ Battery
☐ Other
- Single Phase
Three Phase
Single Phase
Three Phase
VDC
VDC
- Amps
Amps per phase
Amps
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 _____
☐ Water ☐ psi _____
_____ 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.

UEMAC0901.DOC, Revision 1.0
Author: B. Dai
Revised: 20 March 1997

Page 2

File: Standard\UEMAC0901.doc, Revision 1.0

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 TÜV 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 Argueles 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

Serial No.:

N/A

FCC ID No.:

HCC3B63MB3

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:

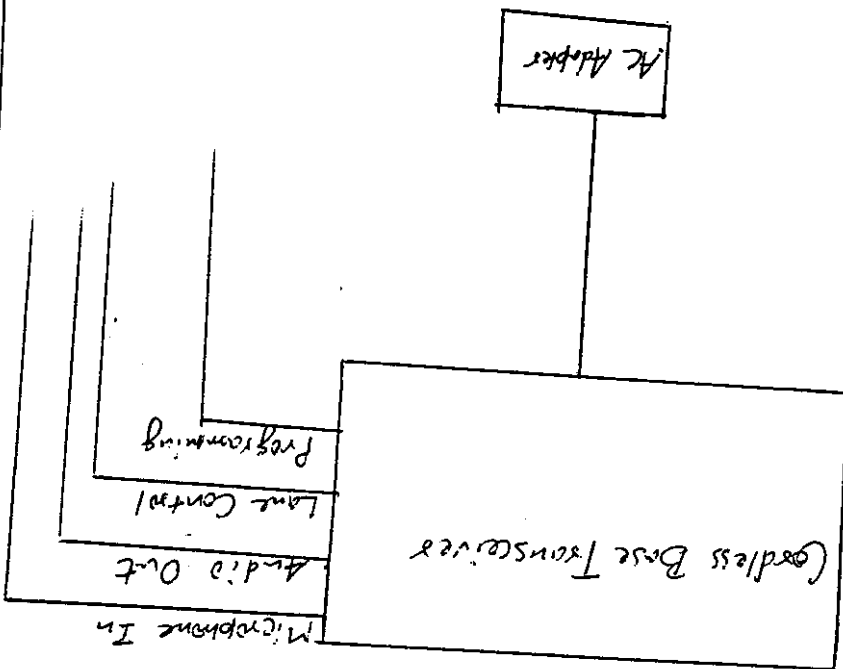
Signature of Applicant:

UEM/C05902.doc, Revision 1.0
Author: B. Dill
Revised: 20 March 1997

Constructional Data Form for Electromagnetic Compatibility Testing



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.



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

Date:

Signature of Applicant:

UEMC0902.doc, Revision 1.0
Author: B. Dai
Revised: 20 March 1997

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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: _____

UENM00902.doc, Revision 1.0
Author: B. Oll
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 shielded or not, type of shield (e.g., Braid, Foil) and how terminated (e.g., 360 degree to conductive shield, 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.

Description: <u>Microphone In</u>	
Type of Port:	
Exercised during testing?	☐ Yes ☐ No
Assembly $\leftrightarrow$ Assembly Interconnect	☐ Yes ☐ No
Cable shielded:	☐ Yes ☐ No
Shield Type (describe)	☒ No
Termination: (describe)	
Transmission Type:	
Length of cable:	Maximum: <u>8 ft</u>
Tested:	☒ Analog ☐ Digital
# of ports/cables of type	

I/O Ports and Cables

Description: <u>Audio Out</u>	
Type of Port:	
Exercised during testing?	☐ Yes ☐ No
Assembly $\leftrightarrow$ Assembly Interconnect	☐ Yes ☐ No
Cable shielded:	☐ Yes ☐ No
Shield Type (describe)	☒ No
Termination: (describe)	
Transmission Type:	
Length of cable:	Maximum: <u>8 ft</u>
Tested:	☒ Analog ☐ Digital
# of ports/cables of type	

I/O Ports and Cables

Description: <u>Line Control</u>	
Type of Port:	
Exercised during testing?	☐ Yes ☐ No
Assembly $\leftrightarrow$ Assembly Interconnect	☐ Yes ☐ No
Cable shielded:	☐ Yes ☐ No
Shield Type (describe)	☐ No
Termination: (describe)	
Transmission Type:	
Length of cable:	Maximum: <u>8 ft</u>
Tested:	☒ Analog ☐ Digital
# of ports/cables of type	

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

Signature of Applicant:

Date:

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.

Description:		Type of Port:		exercised during testing?		assembly $\leftrightarrow$ Assembly Interconnect		able shielded:		shield Type (describe)		termination: (describe)		transmission Type:		length of cable:	
Maximum:		☒ Analog		☒ Yes		☒ Yes		☒ Yes		☒ Yes		☒ Yes		☒ Yes		☒ Yes	
Tested:		☒ Digital		☒ No		☒ No		☒ No		☒ No		☒ No		☒ No		☒ No	
# of ports/cables of type		4 ft															

Description:		Type of Port:		exercised during testing?		assembly $\leftrightarrow$ Assembly Interconnect		able shielded:		shield Type (describe)		termination: (describe)		transmission Type:		length of cable:	
Maximum:		☐ Analog		☐ Yes		☐ Yes		☐ Yes		☐ Yes		☐ Yes		☐ Yes		☐ Yes	
Tested:		☐ Digital		☐ No		☐ No		☐ No		☐ No		☐ No		☐ No		☐ No	
# of ports/cables of type																	

Description:		Type of Port:		exercised during testing?		assembly $\leftrightarrow$ Assembly Interconnect		able shielded:		shield Type (describe)		termination: (describe)		transmission Type:		length of cable:	
Maximum:		☐ Analog		☐ Yes		☐ Yes		☐ Yes		☐ Yes		☐ Yes		☐ Yes		☐ Yes	
Tested:		☐ Digital		☐ No		☐ No		☐ No		☐ No		☐ No		☐ No		☐ No	
# 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 Tech: 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)

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.

Signature of Applicant:

Date:

Constructural 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 #

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



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
	740.24 → 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).

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

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

Date:

Signature of Applicant:

UEMCO902 doc. Revision 1.0
Author: B. DIN
Revised: 20 March 1997

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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:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20(\log \mu\text{V}) \\ \mu\text{V} &= \text{Inverse log}(\text{dB}\mu\text{V}/20) \end{aligned}$$

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
+	+
Factor & Cable (dB)	16.3
=	=
Final (dB μ V/m)	30.2
-	-
FCC B Limit (dB μ V/m)	40.0
=	=
Delta FCC B (dB)	-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 and quasi-peak detection and measurements above 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