

Test Site Services. Inc.

EMI Test Report

For Discovery Corps, Inc.

"Impulse" Transmitter

Model 01

Radiated Emissions

FCC, Part 15C

Test # B90323

Test Site Services, Inc.
P.O. Box 766
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U.S.A.
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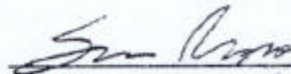
Test Site Services, Inc.

Report # B90323

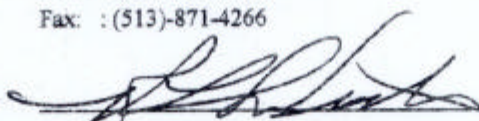
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EMI Test Report
for
Discovery Corps, Inc.


Test Number : B90323**Product Name** : "Impulse" Transmitter**Regulation** : FCC, Part 15C (U.S.)**Date** : 08/19/99**Report Reviewed****& Accepted by:**


Discovery Corps, Inc. *SEAN RUME, PRES*
3436 St. John Place
Cincinnati, Ohio 45208
Phone: (513)-871-0030
Fax: : (513)-871-4266

Report Issued By:


Richard L. Wiedeman, Laboratory Director

Tested By:


Tom Charron, Test Engineer

This test report is not valid without the signatures of Test Site Services, Inc. personnel.

Discovery Corps, Inc.

08/19/99

EUT: "Impulse" Transmitter

Administrative Data

Regulation : FCC, Part 15C (U.S.)
: 15.201 b, 15.209 a,c, 15.215 a,b, 15.231a,b,c

Level : Class A

Test Method : ANSI C63.4-1992

Test Type : Qualification

Manufacturer : Discovery Corps,Inc.

EUT Type/Model # : "Impulse" Transmitter / 01

Date(s) of Test : 08/19/99

Customer Personnel : Sean Rome President

TSS Personnel : R. Wiedeman EMC Engineer
: Tom Charron Test Engineer
: Bob Quinn Test Engineer
: Walt Luczkow Test Engineer

Test Location : Open Area Test Site
Test Site Services, Inc.
30 Birch St.
Milford, MA 01757 U.S.A.

NOTICE	: FCC Rule 2.955 requires that a Verification Report for a Class A Computing Device must be signed by "an Official of the Company responsible for the device". A signature block has been provided on the first page for this purpose.
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EUT Description

The EUT ("Impulse" Transmitter) is a Battery powered transmitter and pager used in restaurants to summon waitstaff.

A complete description of the EUT may be found on block identifier page one.

The tests were run in a typical configuration including the following support equipment;

- 1) Transmitter

REASON FOR TEST

Certification for FCC

CHANGES MADE DURING TEST

- 1) Trimmed Antenna on Transmitter to 5 inches

DEVIATIONS FROM STANDARD TEST METHOD

None

Test Summary

The "Impulse" Transmitter complied with the FCC Part 15 Subpart C 15.209 a,c, 15.215 b, 15.231 b Limits for equipment when tested in the system configuration defined herein.

The following table indicates the margins (i.e. difference between measurement point and limit) of the six (6) worst case data points:

TEST CLASS	MARGIN TO SPEC (db)	FREQUENCY (Mhz)
<i>Fundamental / Harmonics</i>	-2.5	315.03
<i>FCC 15.231 b</i>	-4.0	630.05
315.03 – 3151.25 MHz.	-4.4	1260.10
	-4.8	2520.19
	-6.0	2835.22
	-6.0	3151.25
<i>Spurious Emissions</i>	-17.6	1.7988
FCC 15.209 a, c, 15.215 b	-18.4	3.5790
150 kHz. – 30 MHz.	-23.6	5.3960
	-24.2	7.1950
	-28.3	8.9940
	-29.9	12.5920
<i>Spurious Emissions</i>	-15.6	660.0
FCC 15.209 a, c, 15.215 b	-16.5	590.0
30 MHz. – 1 GHz.	-16.7	500.0
	-17.2	275.0
	-17.6	430.0
	-19.2	315.03
Bandwidth FCC 15.231c	BW < 50 kHz.	Requirement is < 787.5 kHz.

Block Diagram for "Impulse" Transmitter

PS = Power Cord Shielded

DS = Data Cable Shielded

CX = Coaxial Cable

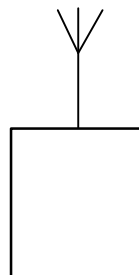
PU = Power Cord Unshielded

DS = Data Cable Shielded

FL = Fiber Link

■ = Ferrite Bead

□ = Connector



Ground Plane

Control Room



EUT Technical Data – Block Identifier 1

Description : “Impulse” Transmitter

Manuf/Model : Discovery Corps,Inc.

Model No.: :01

Part#/Rev : 01

Serial # : N/A

Power (Rated) : 9 VDC (Battery)

Power (Tested) : 9 VDC (Battery)

Internal Options:

None

External Options:

None

Frequencies Generated:

3.579545 MHz.

315.00 MHz.

Comments:

Program Description

TITLE : Impulse

PART #/REV. : 1.0

FUNCTION : To transmit call signal and cancel signal to receiver

REPEAT TIME : After pressing Call or Cancel Button , sends ID code for approx. 1 second, cannot repeat for 15 minute.

Run Instructions :

Press call button to call your server.

Press cancel button to cancel your call

Operational Mode(s) During Test

OPERATIONAL MODES AVAILABLE: Call & Cancel

MODE TESTED: Both

FUNCTION : To Summon waitstaff

RATIONALE : Only modes available.

Test Equipment List

#	Equipment Type	Manufacturer	Model #	Serial #	Cal Date	Cal Due	Used
1	Spectrum Analyzer	Hewlett-Packard	8568B	2207A01917	8/09/99	8/09/00	X
2	Quasi-Peak Adapter	Hewlett-Packard	85650A	2043A00249	8/09/99	8/09/00	X
3	RF Pre-Selector	Hewlett-Packard	85685A	2648A00500	8/09/99	8/09/00	X
4	Spectrum Analyzer	Hewlett-Packard	8566B	2532A02250	5/8/99	5/8/00	X
5	Quasi-Peak Adapter	Hewlett-Packard	85650A	2521A00665	5/8/99	5/8/00	X
6	RF Pre-Selector	Hewlett-Packard	85685A	2510A00186	5/8/99	5/8/00	X
7	EMI Receiver	Rhode & Schwarz	ESV33	8726315	9/18/98	9/18/99	
8	Comb Generator	Com Power	CG-520	20129	5/18/99	5/18/00	
9	RF Probe	Fischer	F-33-1	367	7/14/98	7/14/99	
10	RF Pre-Amplifier	Hewlett Packard	8447D	1937A02850	5/24/99	5/24/00	X
11	Pre-Amplifier	Hewlett-Packard	8449B	3008A00952	5/27/99	5/27/00	X
12	Biconical Antenna	Schwarzbeck	BBA9106	0101	5/11/99	5/11/00	X
13	Biconical Antenna	Schwarzbeck	BBA9106	0102	5/11/99	5/11/00	
14	Log Periodic Antenna	Schwarzbeck	UHALP9107	9107718	6/1/99	6/1/00	X
15	Log Periodic Antenna	Schwarzbeck	UHALP9107	0103	6/1/99	6/1/00	
16	Mag Loop Antenna	EMCO	6502	9307-2841	6/1/99	6/1/00	
17	Horn Antenna	EMCO	3115	9308-4132	10/21/98	10/21/99	X
18	Active Monopole Ant.	EMCO	3301B	9510-3625	5/29/99	5/29/00	X
19	Tuned Dipole Antenna	Comp Design	A100	445	1/18/99	1/18/00	
20	Tuned Dipole Antenna	Comp Design	A100	494	8/20/98	8/20/99	
21	LISN 3x24 A	Solar	8012-50-24	0103	9/15/98	9/15/99	
22	LISN 4x25A	EMCO	3852/2	8904-1483	7/09/99	7/09/00	
23	LISN 4 x 25 A	Schwarzbeck	NNLA8120	8120458A	8/21/98	8/21/99	
24	LISN 4 x 100 A	Schwarzbeck	NNLA8121	8121237	1/21/99	1/21/00	
25	Antenna Mast	EMCO			Daily	Daily	X
26	Mast Controller	EMCO	1050	1267	Daily	Daily	X
27	Turntable	Macton			Daily	Daily	X
28	Turntable Controller	EMCO	101762	8908-1290	Daily	Daily	X

Appendix A

TEST DATA

EUT : DISCOVERY CORPS.
: IMPULSE TRANSMITTER
: Spurious Emissions Per:
: FCC 15.209 a ,c, 15.215 b

Engineer : R Wiedeman
Technician : T CHARRON

Antenna Ht : 1-4 Meters
Antenna Sep : 10 Meters

Test: B90323
Date: 08/19/99
Power: 9 VDC
Spec: FCC

Receiver BW : 120 KHz from 30 MHz. to 1000 MHz.

NOTES: Transmitter on Turntable

Temperature: 71 F
Rel. Humidity: 44 %

Antennas Used:

Biconical_A
Log Periodic_A

[illegible]

Note: BB = BroadBand

Note: RBW = Reduced Bandwidth (kHz)

Note: MWA = Mixed With Ambient

Note: No signals observed above: 660.0 MHz

Note: Moved Cables at Worst Case Frequencies

Polarization: H = Horizontal

V = Vertical

Ambient Check: 96.1 MHz

525.25 MHz

1938.42

Note;VBW=VideoBand Width

TSS B90323

EUT : DISCOVERY CORPS.
: "IMPULSE TRANSMITTER"
: Fundamental / Harmonics
: Per FCC 15.231 b

Engineer : R Wiedeman
Technician : T CHARRON

Antenna Ht : 1-4 Meters
Antenna Sep : 31 Meters

Test: B90323
Date: 08/04/99
Power: 9 VDC
Spec: FCC
Class A

Antennas Used:

Receiver BW : 120 KHz from 30 MHz. to 1000 MHz.
1 MHz. from 1 GHz. To 40 GHz.

Temperature: 74 F
Rel. Humidity: 52 %

NOTES: TRANSMITTER ON TURNTABLE

Horn_A
Log Periodic_A[illegible][illegible]

Fundamental Frequency
VBW = 1 Hz.

Note: BB = BroadBand

Note: RBW = Reduced Bandwidth (kHz)

Note: MWA = Mixed With Ambient

Note: No signals observed above: 3151.3 MHz

Note: Moved Cables at Worst Case Frequencies

Polarization: H = Horizontal

V = Vertical

Ambient Check: 96.1 MHz	54.9
-------------------------	------

525.25 MHz $\overline{12.3}$

1938.4 72.3

Note;VBW=Video Band Width

TSS B90323

Test Type: **QUALIFICATION**

RADIATED EMISSIONS (MONOPOLE)

Page 1

Data by Test Site Services Co

EUT : **DISCOVERY CORPS.**
 : **Impulse Transmitter**
 : **Spurious Emissions Per:**
 : **FCC Part 15.209 a, c, 15.215 b**

Engineer : **R. Wiedeman**
 Tech : **BOB QUINN / WALT LUCZKOW**
3M ANT. SEPARATION

Test : **B90323**
 Date : **8/17/99**
 Power : **9 VDC**
 Spec : **FCC**

Receiver BW : 9 kHz. from 150 kHz. - 30 MHz.

Temperature: **71 F**
 Relative Humidity: **44 %**

ANTENNA : **MONOPOLE 3301B**

Freq	Detector	RVCR	Cable	Corr	Product	Limit	Margin
MHz	P/QP	Ave	Loss	Fact	Level	FCC	FCC
		dBuV	dB	dB	dBuV	dBuV	dB
1.7988	P	28.1	0.3	3.5	31.9	49.5	-17.6
3.5790	P	26.8	0.5	3.8	31.1	49.5	-18.4
10.7386	P	9.0	0.9	4.6	14.5	49.5	-35.0
17.8980	P	7.9	1.2	5.3	14.4	49.5	-35.1
21.4770	P	6.1	1.4	5.5	13.0	49.5	-36.5
25.0570	P	6.2	1.5	5.9	13.6	49.5	-35.9
28.6360	P	4.9	1.6	6.3	12.8	49.5	-36.7
5.3960	P	21.3	0.6	4.0	25.9	49.5	-23.6
7.1950	P	20.4	0.7	4.2	25.3	49.5	-24.2
8.9940	P	15.8	0.9	4.5	21.2	49.5	-28.3
12.5920	P	13.9	1.0	4.7	19.6	49.5	-29.9
16.1890	P	8.7	1.2	5.1	15.0	49.5	-34.5
19.7870	P	7.2	1.3	5.4	13.9	49.5	-35.6
23.3840	P	6.1	1.4	5.8	13.3	49.5	-36.2
26.9820	P	5.4	1.5	6.1	13.0	49.5	-36.5

Table	
Azimuth	
Degrees	
270	
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270	

	Comments
	AMIBIENT NOISE FLOOR
	AMIBIENT NOISE FLOOR
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	AMIBIENT NOISE FLOOR
	AMIBIENT NOISE FLOOR
	AMIBIENT NOISE FLOOR
	AMIBIENT NOISE FLOOR
	Signals Below Taken at Multiples of 1/2 FUNDAMENTAL
	AMIBIENT NOISE FLOOR
	AMIBIENT NOISE FLOOR
	AMIBIENT NOISE FLOOR
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	AMIBIENT NOISE FLOOR

Note : BB = Broad Band.

Note : RBW = Reduced Band Width.

Note : MWA = Mixed With Ambient.

Note : FCC and CISPR Margins Reflect Data Taken at

9 VDC

Appendix B

TEST PHOTOGRAPHS

RADIATED EMISSIONS PHOTOGRAPHS



RADIATED EMISSIONS PHOTOGRAPHS



Appendix C

TEST PROCEDURES

Test Procedures - EMI Operational Description

GENERAL

For each emission signal, maximum level is achieved for both horizontal and vertical polarizations as well as (0-360) degrees turntable rotation.

Antenna Test Distances are selected at either 3, 10 or 30 meters separation from the EUT in accordance with applicable specification requirements.

Antenna Scan Heights are varied from 1-4 meters at Antenna Test Distances of 3, 10 and 30 meters.

FCC RADIATED EMISSIONS (E-FIELD)

EMI test procedures are performed in accordance with the requirements of ANSI C63.4 (1992). Measurements are initially obtained using broad band antennas and PEAK detection. In addition, cables are manipulated to maximize emissions within constraints of a typical system configuration. All measured data within 3 db of the Radiated Limits are retaken using Tuned Dipole Antennas (Roberts Type) and QUASI-PEAK (CISPR) Detection. Each EUT is powered from a 60Hz AC source.

FCC CONDUCTED EMISSIONS

EMI test procedures are performed in accordance with the requirements ANSI C63.4 (1992). Measurements are initially obtained with PEAK Detection. In addition, cables are manipulated to maximize emissions within constraints of a typical system configuration. All measured data within 3 db of the Conducted Limits are retaken using QUASI-PEAK (CISPR) Detection. Each EUT is powered from a 60Hz AC source.

CISPR22/EN55022 RADIATED EMISSIONS (E FIELD)

EMI test procedures are operated in accordance with the requirements of the CISPR22 (1993) and EN55022 (1987) Documents. Measurements are initially obtained with PEAK Detection. In addition, cables are manipulated to maximize emissions within constraints of a typical system configuration. All measured data within 3 db of the Radiated Limits are retaken using QUASI-PEAK (CISPR) detection. Each EUT is powered from a 50Hz AC source.

CISPR22/EN55022 CONDUCTED EMISSIONS

EMI test procedures are operated in accordance with the requirements of the CISPR22 (1993) and EN55022 (1987) Documents. Measurements are initially obtained with PEAK Detection. In addition, cables are arranged per the specification within constraints of a typical system configuration. All measured data exceeding 3 db below the Conducted QP Limit are retaken using QUASI-PEAK (CISPR) Detection. All measured data exceeding 2 db below the Conducted AVERAGE Limit are retaken using AVERAGE (CISPR) Detection. Each EUT is powered from a 50Hz AC source.

Appendix D

MEASUREMENT FACILITIES INFORMATION

DESCRIPTION of MEASUREMENT FACILITIES

The Open Area Test Site (OATS) is composed of a building and associated ground screen with a control room underneath.

The building is a TUFF-SPAN enclosure constructed of fiberglass reinforced plastic materials which provide above-ground weather protection. These materials are non conductive, non magnetic and RF transparent. They do not impact the surrounding electromagnetic environment and are corrosion resistant. The enclosure size permits Ten Meter Radiated Measurements within its confines and utilizes a remote controlled Macton Turntable Assembly. The conductive turntable is 16 feet in diameter and capable of moving a 10,000 pound load a full 360 degrees of rotation. It is flush-mounted to the ground screen and edge bonded circumferentially to the ground screen with beryllium copper "fingers". The ground screen is constructed of welded wire mesh lying directly on top of a concrete-over-steel foundation. The screen is extended beyond the building itself to provide 30 meter measurement capability when needed. There are no reflecting objects within the required obstruction free oval area.

The control room is located beneath the ground screen level with stairwell access to the ground plane area. An elevator is located beyond the ground screen and provides access to the control room, shipping dock and ground screen areas for large sized EUT's. Primary power cabling to the EUT is fed through a hole in the center of the table along with necessary EUT/Support Equipment interface cabling. A remote controlled EMCO Antenna Mast Assembly is located on the ground screen. It provides the operator with adjustable antenna height over the 1 meter through 4 meter range as well as allowing both horizontal and vertical polarizations at any height.

A conducted emissions measurement area is located in a shielded room and consists of a conductive (galvanized sheet metal) wall 20' wide x 8' high with a metal floor bonded to the wall. AC Power is supplied through receptacles located on the vertical wall. Each receptacle is adequately filtered using Shielded Room EMI Power Line Filters (Rayproof 1B42 Units) which provide 100 db attenuation over the 14KHz to 10GHz frequency range. The shielded room itself is bonded directly to earth ground.

Additionally, both the control room/shielded rooms and ground plane area have heating, air conditioning and relative humidity controlled environments.

Capability

Test Site Service's open area Test Sites have been evaluated in accordance with ANSI C63.4 procedures and found to be in compliance with ANSI C63.4-(1992) Site Attenuation and LISN requirements.

In addition, Test Site Services is Assessed and Approved annually by a European Competent Body to assure competence in testing products for CE Mark Compliance (Emissions and Immunity).

All of Test Site Service's measurement facilities meet the technical requirements for qualification testing of products to FCC, CISPR, IEC, VCCI, BSMI and other International Standards.

Accreditation / Approval

- FCC Registered
- VCCI Registered
- BSMI Accreditation
- NVLAP Accredited
- AUSTEL Listed
- New Zealand Approved (Ministry of Commerce)
- Competent Body Assessment / Approval (Technology International, UK)
- Sub-Accredited by Hewlett Packard (Mass. Medical Environmental Test Lab.)
- NARTE certified EMC Engineers

PO BOX 766
MARLBORO, MA 01752
(508)634-3444

Thank you for choosing to use the Test Site Services EMC test facilities to test your product. Client satisfaction is very important to Test Site Services. To help serve you fully and continue to make improvements in our service, we need your feedback and comments on the service we performed for you today. We would appreciate your taking a few moments to complete this questionnaire.

1. Did scheduling meet your needs _____
2. Test operator support _____
3. Personnel attitude _____
4. Efficiency of test process _____
5. Work completed in a timely manner _____
6. Report received in a timely manner _____
7. Report content and clarity _____
8. Overall rating _____
9. Additional Comments:

Completed By: _____

Please return to: Lab Manager or Richard L. Wiedeman
(At Test Site) President
Test Site Services, Inc.
PO Box 766
Marlboro, MA 01752