Test Report No.8812364171

Applicant: ***ElmoTech Ltd.***

Equipment Under Test:

GPS Mobile Monitoring Unit

Name: ***STaR***

Model: ***STaR-800-2***

From:
The Standards Institution of Israel
Industry Division
Electronics & Telematics Laboratory
EMC Branch

ACLASS Accreditation Services

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Title: Test on GPS Mobile Monitoring Unit **Name: STaR, Model: STaR-800-2**

Applicant:	ElmoTech Ltd.
Address:	2 Habarzel Street, POB 13236, Tel-Aviv, Israel
Sample for test selected by:	The customer
The date of tests:	3 & 8/12/2008

Description of Equipment Under Test (EUT):	GPS Mobile Monitoring Unit
Name:	STaR
Model:	STaR-800-2
Manufactured by:	ElmoTech Ltd.

Reference Documents:

- CFR 47 FCC: "Rules and Regulations":
  Part 15. "Radio frequency devices",
  Subpart B: Unintentional radiators (2007).

Test Results: The EUT was found to be in compliance with the requirements of the standard FCC Part 15 Subpart B Class B.

This Test Report contains 19 pages and may be used only in full.	This Test Report applies only to the specimen tested and may not be applied to other specimens of the same product.

Table of Contents

1. EUT Description and operation

Note: All the information below was supplied by the customer.

1.1. General description:

The Equipment Under Test (hereinafter: EUT) is a GPS Mobile Monitoring Unit

The STaR-800-2 is a portable personal locator device designed to be worn on the belt of offender's participating in GPS tracking programs. The STaR unit receives signals from GPS satellites in order to determine the location of the offender at any given time. The location data is uploaded to the monitoring station over the cellular network.
To ensure that the offender is in close proximity to the unit, the STaR monitors signals received from a bracelet transmitter attached to the offender's ankle.
The STaR-800-2 is a battery-operated unit and comprises a GPS receiver, a 433.92 MHz RF receiver and a cellular modem.

EUT environmental conditions (in normal operation mode to give the confidence of compliance for the affected technical requirements):

Temp. – [-20 to 55] °C.
Humidity – 93% RH Max.

Power supply: 9 VDC.
The unit is powered by a 7.2V, Li ion battery and is charged by a 100-240VAC to 9 VDC Power Supply (hereinafter: PS).

The EUT dimensions: 14 x 8 x 3.5 cm (approx.)

The EUT bock diagram is shown in Figure 1.
The EUT views can be found in Appendix 4.

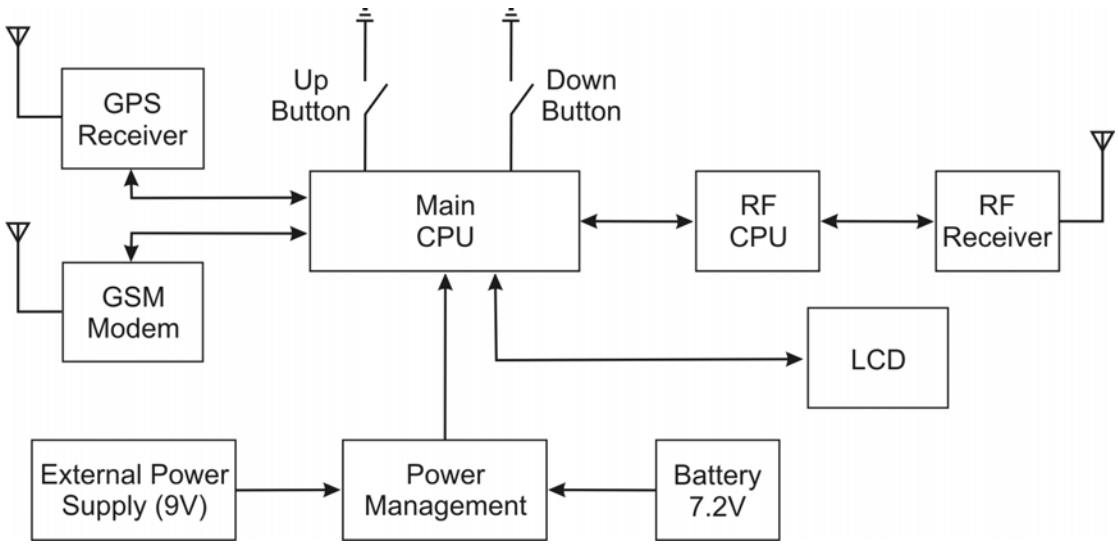


Figure 1. EUT block diagram

Note: All description in clauses below is provided by the manufacturer.

1.2. EUT's sub-assemblies list:

The EUT's sub-assemblies list is detailed in Table 1.

Table 1. Sub-assemblies list

Description (function)	Manufacturer	Model
GPS Mobile Monitoring Unit includes:	**ElmoTech Ltd.**	**STaR-800-2**
Main Board	ElmoTech	CPU 1.6
ADP. G24 V1.6 MOT.	ElmoTech	1.6
Modem GSM Motorola G24 Quad Band	Motorola	F6403AAF
Antenna GSM 1900MHz	Galtronics	020786074-2297L
Antenna for GPS 28Db	Info	JXTXGPS-CZ-1575-75N
Battery Pack Lithium-Ion 7.4V 1.95Ah	Panasonic	CGA103450
External AC / DC Power Supply (PS) IN: 100 – 240 VAC, 1 A OUT: 9 VDC, 1333 mA	**ElmoTech Ltd.** (Taiwan Lynx Co. Ltd.)	**SE090133**

1.3. EUT connectors list:

A list of the EUT connectors / cables is detailed in Table 2.

Table 2. Connectors / cables list

No.	Port description	Connector type	Type of Cable	Length (m)	No. of identical connectors
1	9 VDC power inlet	DC Jack	Unshielded DC power cord	1.8	1
2	120 VAC mains	Standard	Direct connection	--	1

Note: All description in clauses below is provided by the manufacturer.

1.4. Potential emission sources:

The potential emission sources are detailed in Table 3.

Table 3. Potential emission sources

Frequency	Location
423.22 MHz	Voltage control oscillator
26.45125 MHz	Reference frequency of receiver
16.00 MHz	Crystal resonator of CPU (controller) RF
4.00 MHz	Crystal resonator of main CPU (controller)
3.39 MHz	Crystal resonator of infrared communication
32.768 kHz	Crystal resonator of RTC (real time clock)

1.5. EUT setup and operation:

The EUT was placed on the table and was setup as shown in Figure # 2.

Operation modes:

Normal operation mode (for radiated emission test);

Charge mode - The EUT and was powered via external PS supplied by 120 VAC mains (for Radiated and conducted emission tests).

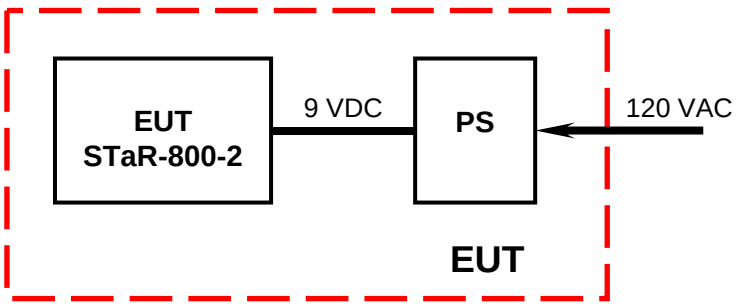


Figure # 2.
Charge mode: Radiated and Conducted Emission test setup

2. Test specification, Methods and Procedures

- CFR 47 FCC: "Rules and Regulations":
  Part 15. "Radio frequency devices",
  Subpart B: Unintentional radiators (2007).
- ANSI C63.4:2003: "American National Standard for Method of Measurement of Radio Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range 9 kHz to 40 GHz".

3. Additional deviations or exclusions from the test specifications

Not applicable.

4. Measurements, examinations and derived results

4.1. Location of the Test Site:

The Conducted Emission tests and the preliminary Radiated Tests were carried out in the EMC laboratory of the Standards Institution of Israel in Tel-Aviv.

The final Radiated Emission tests were conducted in an Open Area Test Site located at Kibbutz Native Halamed Hai in Emek HaEla, Israel.

4.2. Test condition:

Temperature: 21°C. Humidity: 51 %. Atmospheric pressure: 1010 mbar.

4.3. Emission tests:

- For both Radiated and Conducted measurements, initial scans were made using a peak detector but still using the appropriate CISPR 16 (Quasi-Peak) detector IF bandwidth.
- For conducted emissions, was set a tolerance limit of 6 dB below the specification limit. Levels above the tolerance limit were retested using a Quasi-Peak detector or an Average detector.
- For Radiated Emissions, a tolerance limit of 10 dB below the specification limit was set. Levels above the tolerance limit were retested using the Quasi-Peak detector.
- Unless otherwise stated, all the plots shown in Clause 4.5.4 are from scans where a peak detector was used.

4.4. Initial visual check and functional test:

An initial visual check was performed before testing.

No external damages were found.

4.5. Conducted emission tests:

4.5.1. General:

The test was performed according to the requirements of standard FCC Part 15 Subpart B.

4.5.2. Test Configuration:

The EUT was configured as described in clause 1.5.

The EUT was placed on a non-metallic table in a shielded chamber at 80 cm height above the shielded chamber floor and at 40 cm distance from the reference vertical ground plane.

4.5.3. Test procedure:

The EUT was operated according to clause 1.5, in Charge mode.
An initial scan was performed. The final measurements were performed for emission that exceeded the tolerance limit.

Test equipment (EMI receiver) setup was as follow:

Initial scan:	
Detector type	Peak
Mode	Max hold
Bandwidth	9 kHz
Step size	Continuous sweep
Sweep time	>100 msec

Measurements:	
Detector type	Quasi-peak (CISPR)
Bandwidth	9 kHz
Observation	>15 seconds

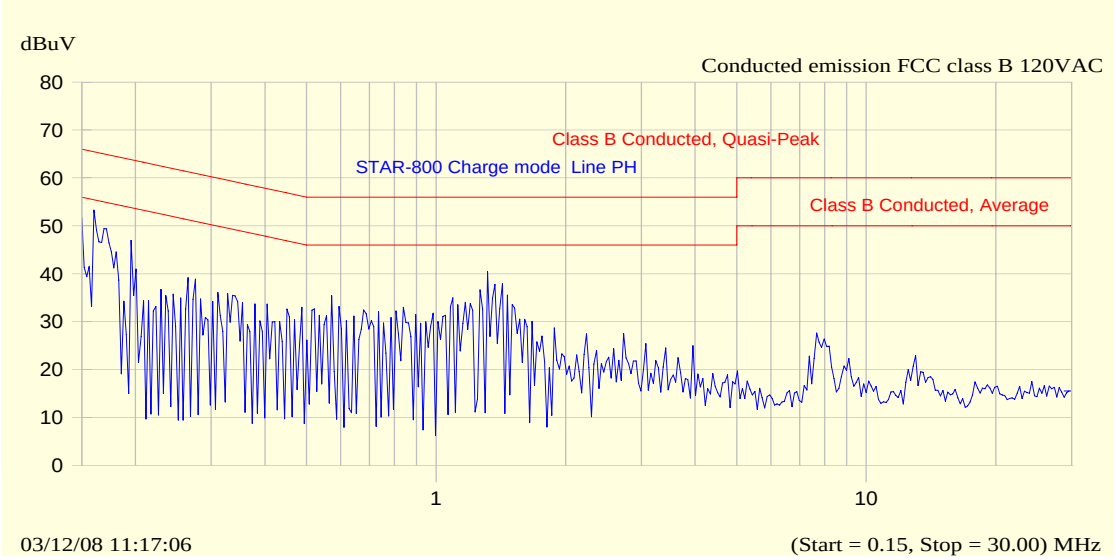
4.5.4. Test results:

All received conducted emissions measured at 120 VAC mains to PS were found below FCC Part 15 Subpart B Class B limits.

The worst result measured on Neutral line at 0.18 MHz with QP detector was 1.0 dB below Class B AVG limit.

Test Results and Plots #1 -#2 are shown below.

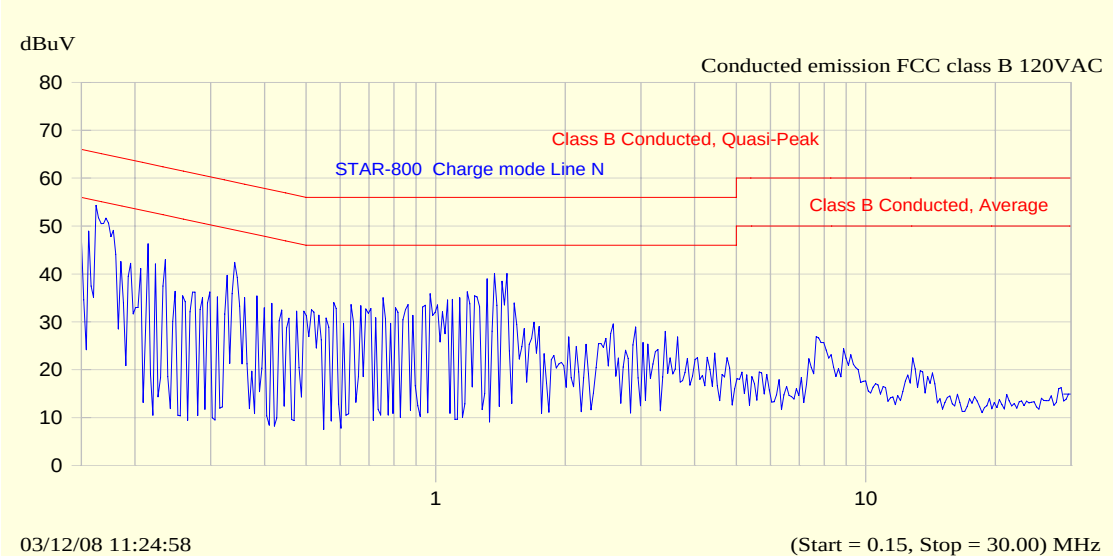
Scans of conducted emission at 120 VAC mains to PS
Specified limits: Specified limits: FCC Part 15 Subpart B Class B



Frequency	Peak meas.	QP meas.	Avg limit	QP meas. - AVG Limit
MHz	dBuV	dBuV	dBuV	dB
0.176	52.3	50.4	54.7	-4.3
0.230	43.2	35.2	52.5	-17.3
0.345	36.3	34.0	49.1	-15.1
0.399	35.5	30.2	47.9	-17.7
1.395	41.5	36.4	46.0	-9.6
1.486	40.0	34.0	46.0	-12.0

Plot # 1. Tested line: PHASE

Scans of conducted emission at 120 VAC mains to PS
Specified limits: Specified limits: FCC Part 15 Subpart B Class B



Frequency	Peak meas.	QP meas.	Avg meas.	Avg Limit	QP meas. - AVG Limit
MHz	dBuV	dBuV	dBuV	dBuV	dB
0.176	56.2	53.7	45.2	54.7	-1.0
0.230	45.8	37.9	16.3	52.4	-14.6
0.345	42.9	41.2	34.1	49.1	-7.9
0.399	35.8	30.4	11.0	47.9	-17.4
1.395	41.7	36.9	25.3	46.0	-9.1
1.486	36.7	33.3	17.8	46.0	-12.7

Plot # 2. Tested line: Neutral

4.6. Radiated emission test:

4.6.1. General:

The test was performed according to the requirements of standard FCC Part 15 Subpart B.

4.6.2. Preliminary radiated emission tests:

Preliminary radiated measurements were performed in a semi-anechoic chamber at 3 meters distance.
The EUT was setup in its typical configurations and operated in both operation modes, as detailed in clause 1.5.
For each case the frequency spectrum was monitored.
The EUT configuration, the cable configuration and the operation mode that produced the maximum level of emission, were documented.
A list of frequencies to be tested was prepared.
The worst result from both measurements was received for Charge mode.

4.6.3. Final measurements:

The EUT was configured as described in clause 1.5. The EUT was arranged on a non-metallic table of 0.8 m height, placed on the turntable.
The photos of the test layout are presented in Appendix 4.
The EUT was operated in Charge mode.
The frequency range was investigated as follows:

1. from 30 MHz to 1 GHz.
   The measurements were performed at the Open Area Test Site at a 3 m measurement distance.
   The Bilog 30 MHz-2 GHz antenna was used.
2. from 1 GHz to 4.5 GHz.
   The measurements were performed in a semi-anechoic chamber at a 3 m measurement distance.
   The Double Ridged Antenna was used.

The EUT's configuration and mode of operation, that produced the maximum level of emissions, were selected.
The measurements were performed at each frequency at which the signal was 10 dB below the limit or less.
The level were maximized by initially rotating turntable through 360°, varying the antenna height between 1 m and 4 m, rerouting EUT cables and changing antenna polarization from vertical to horizontal. The measuring equipment settings were:

Initial scan:	
Detector type	Peak
Mode	Max hold
Bandwidth	120 kHz
Step size	Continuous sweep
Sweep time	>1 seconds/MHz

Measurements:	
Detector type	Quasi-peak (CISPR)
Bandwidth	120 kHz
Measurement time	20 seconds/MHz
Observation	>15 seconds

(For antenna and cable factors – see Appendix 3). Unless otherwise stated, the EUT was operated in the mode described in clause 1.5.

4.6.4. Radiated emission test results:

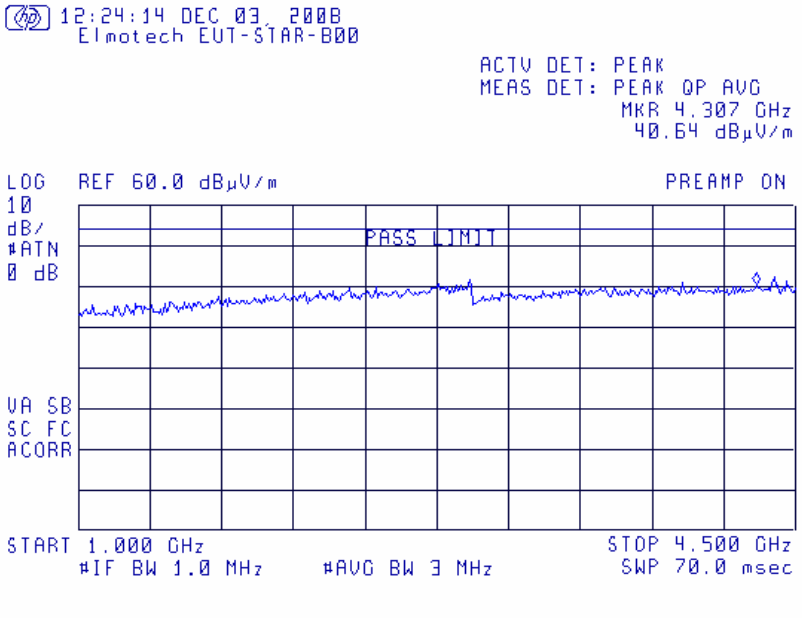
All received emissions from the EUT (for Charge mode) in the frequency range from 30 MHz to 1.0 GHz were found at least 10 dB below of FCC Part 15 Subpart B Class B limits (see Table 4).
All received emissions from the EUT (for Charge mode) in the frequency range from 1.0 GHz up to 4.5 GHz were found below of FCC Part 15 Subpart B Class B limits (see Plot # 3).

Table 4. Radiated emission test results

Specified limits: FCC Part 15 Subpart B Class B

Frequency (MHz)	Antenna Polariz.	Antenna Height (m)	Turn-table Angle (°)	Emission Level (@ 3 m (dBμV/m)	Limit @3 m (dBμV/m)	Margin (dB)	Results
182.3	V	1.00	28	27.8	43.5	15.7	Complies

Note: Emission level = E Reading (dBμV) + Cable loss (dB) + Antenna Factor (dB/m)
For Cable Loss and Antenna Factor refer to Appendix 2.



Plot # 3. Scans of radiated emission
Frequency range from 1.0 GHz to 4.5 GHz
Specified limits: FCC Part 15 Subpart B Class B

5. Compliance with specification

Test	Standard	Class/ Severity level	Test result
Conducted emission on mains terminal Frequency range: 150 kHz - 30 MHz	FCC Part 15 Subpart B	Class B at 120 VAC mains to PS	Complies
Radiated emission Frequency range: 30 MHz – 4.5 GHz		Class B	Complies

Electronics &
Telematics Laboratory
12 January 2009

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6. Appendix 1: Test equipment used

All measurements equipment is on SII calibration schedule with a recalibration interval not exceeding once a year.

FCC Part 15 Subpart B

Instrument	Manufac-turer	Model	SII No.	Last calibration date	Next calibration date
EMI Receiver	HP	8546A+85460A	4068	04/08	04/09
EMI Analyzer	HP	E7405A	4944	11/08	11/09
LISN 9 kHz – 30 MHz	FCC	LISN-50/250-32-4-16	5023	09/08	09/09
Transient limiter 0.009-200 MHz	Agilent Techn	11947A	31074A3105	06/08	06/09
Biconilog Antenna 30 – 2000 MHz	Schaffner	CBL6112D	5866	09/08	09/09
Double Ridged Waveguide Antenna 1-18 GHz	EMCO	3115	4873	08/08	08/09
Antenna Mast	R&S	HCM	3379	N/A	N/A
Metallic turntable	R&S	HCT12	3378	N/A	N/A
Positioning controller	R&S	HCC	3378	N/A	N/A
Impedance stabilization network	Schaffner	ISN T400	5375	06/08	06/09

7. Appendix 2: Measurement uncertainty

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error.
The laboratory calibrates its standards by a third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements.

Test description	Expanded uncertainty
Conducted emissions	uncertainty at 95% confidence from 150 kHz to 30 MHz: 2 Uc (P) = ± 2.8 dB
Radiated emissions in the open field test site at 10 m measuring distance at 3 m measuring distance	uncertainty at 95% confidence Biconilog Antenna 2 Uc (E) = ± 4.18 dB 2 Uc (E) = ± 4.32 dB

8. Appendix 3: Antenna Factor and Cable Loss

Cable Loss (10m cable + Mast)

Point	Frequency (MHz)	Cable Loss (dB)	Point	Frequency (MHz)	Cable Loss (dB)
1	30	0.53	21	1000	3.68
2	50	0.75	22	1100	3.82
3	100	1.08	23	1200	4.07
4	150	1.39	24	1300	4.24
5	200	1.61	25	1400	4.43
6	250	1.752	26	1500	4.6
7	300	2.00	27	1600	4.7
8	350	2.15	28	1700	4.85
9	400	2.26	29	1800	4.98
10	450	2.383	30	1900	5.19
11	500	2.52	31	2000	5.34
12	550	2.606	32	2100	5.51
13	600	2.75	33	2200	5.69
14	650	2.856	34	2300	5.89
15	700	3.06	35	2400	6.07
16	750	3.201	36	2500	6.22
17	800	3.27	37	2600	6.28
18	850	3.38	38	2700	6.41
19	900	3.46	39	2800	6.53
20	950	3.55	40	2900	6.84

Antenna Factor
For Double Ridged Waveguide Antenna manufacturer EMCO Type 3115
1 GHz to 18 GHz

No.	f / MHz	AF / dB/m	f / MHz	AF / dB/m	f / MHz	AF / dB/m
1	1000	23.9	7000	36	13000	39.8
2	1500	25.4	7500	37.4	13500	40.9
3	2000	27.7	8000	37.8	14000	42.5
4	2500	28.8	8500	38.1	14500	41.5
5	3000	30.5	9000	38.2	15000	39.3
6	3500	32	9500	38.3	15500	38.5
7	4000	32.9	10000	38.5	16000	38.7
8	4500	32.9	10500	38.4	16500	39.5
9	5000	33.9	11000	38.7	17000	41.6
10	5500	34.7	11500	39.4	17500	45
11	6000	35.3	12000	39.4	1800	46.8
12	6500	34.5	12500	39.1		

Antenna Factor

For Bilog Antenna, Model Number: CBL 6112D, S/N: 23181

No.	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m	f / MHz)	AF / dB/m
1	30	17.90	170	9.40	530	17.70	1040	22.20
2	32	16.70	175	9.00	540	18.25	1060	22.50
3	34	15.55	180	8.50	550	18.60	1080	22.50
4	36	14.35	185	8.45	560	14.45	1100	22.40
5	38	13.30	190	8.60	570	18.40	1120	22.60
6	40	12.20	195	8.85	580	18.50	1140	22.45
7	42	11.05	200	8.95	590	18.60	1160	22.50
8	44	9.95	205	8.80	600	18.60	1180	22.40
9	46	8.90	210	8.50	610	18.80	1200	22.80
10	48	8.05	215	8.20	620	18.99	1220	22.95
11	50	7.30	220	8.50	630	19.05	1240	23.10
12	52	6.80	225	9.00	640	19.23	1260	23.40
13	54	6.45	230	9.65	650	19.10	1280	23.35
14	56	6.00	235	10.30	660	19.13	1300	23.62
15	58	5.70	240	11.00	670	19.04	1320	23.64
16	60	5.45	245	11.60	680	19.00	1340	23.86
17	62	5.30	250	12.00	690	19.17	1360	23.95
18	64	5.20	255	12.45	700	19.28	1380	23.90
19	66	5.30	260	12.85	710	19.25	1400	24.45
20	68	5.30	265	12.50	720	19.45	1420	24.74
21	70	5.35	270	12.45	730	19.75	1440	24.93
22	72	5.50	275	12.40	740	19.95	1460	25.03
23	74	5.80	280	12.55	750	20.07	1480	25.45
24	76	6.00	285	12.65	760	19.85	1500	25.30
25	78	6.60	290	12.75	770	19.80	1520	25.25
26	80	6.70	295	12.95	780	19.85	1540	25.36
27	82	7.15	300	13.00	790	19.95	1560	25.58
28	84	7.60	310	13.35	800	20.05	1580	25.50
29	86	8.10	320	13.75	810	20.10	1600	25.65
30	88	8.50	330	13.85	820	20.35	1620	25.60
31	90	8.90	340	14.10	830	20.40	1640	25.70
32	92	9.20	350	14.50	840	20.35	1660	25.83
33	94	9.75	360	14.70	850	20.46	1680	25.97
34	96	9.95	370	14.90	860	20.39	1700	26.10
35	98	10.20	380	15.10	870	20.29	1720	26.25
36	100	10.50	390	15.45	880	20.24	1740	26.04
37	105	11.25	400	16.00	890	20.35	1760	26.14
38	110	11.70	410	16.40	900	20.55	1780	26.20
39	115	11.70	420	16.70	910	20.45	1800	26.40
40	120	11.80	430	16.35	920	20.60	1820	26.64
41	125	11.80	440	16.30	930	20.60	1840	26.86
42	130	11.70	450	16.30	940	20.66	1860	27.12
43	135	11.35	460	16.70	950	20.88	1880	27.00
44	140	10.95	470	17.05	960	21.11	1900	27.25
45	145	10.35	480	17.20	970	20.93	1920	27.36
46	150	10.05	490	17.30	980	21.03	1940	27.68
47	155	9.70	500	17.40	990	21.05	1960	27.10
48	160	9.70	510	17.50	1000	21.10	1980	27.06
49	165	9.45	520	17.60	1020	21.40	2000	27.25

9. Appendix 4: Test configuration photographs:

This appendix contains the following illustrations (photographs):

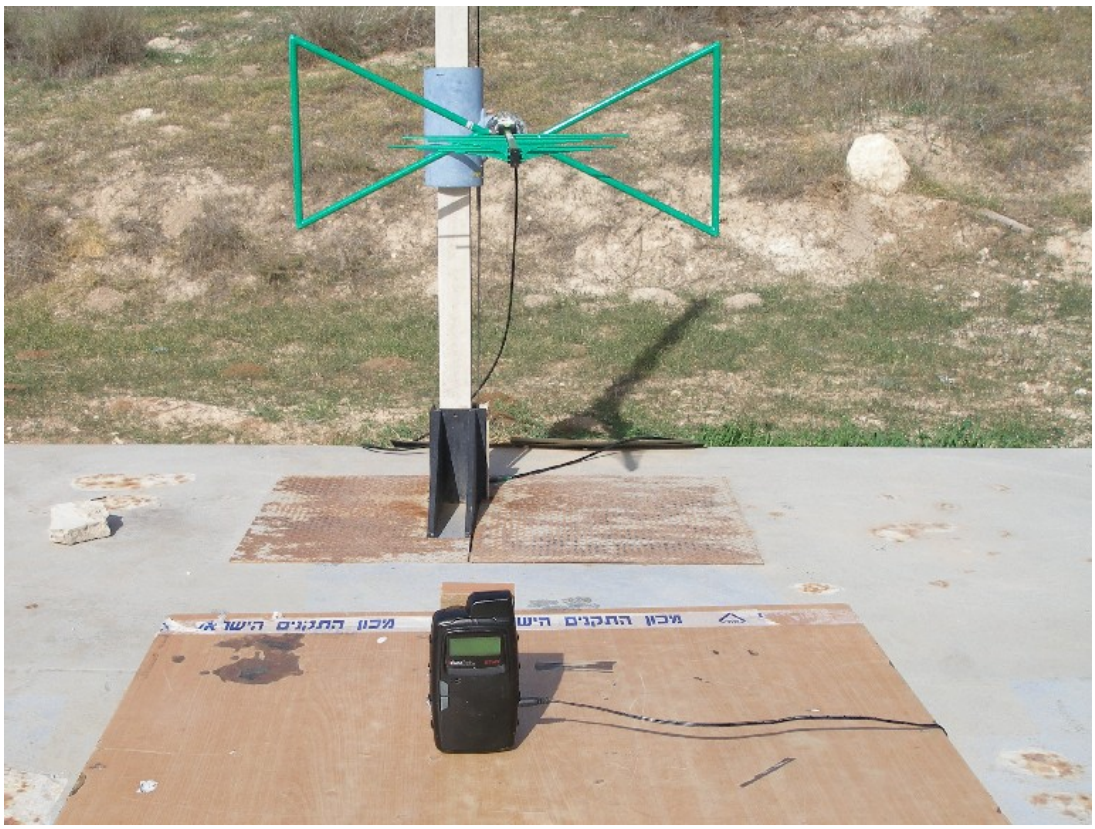

Photo # 1.
Radiated emission test setup – Charge mode
Front / overall view

Photo # 2.
The EUT's front and top panel views

Photo # 3.
AC / DC Supply (PS) - Label