

Test Report No.8312314587

For Synel Industries Ltd.

***Equipment Under Test:
Proximity Reader
Model: PRX30/3A***

***From The Standards Institution
Of Israel
Industry Division
Telematics Laboratory
EMC Section***



Certificate No. 1487-01

**Test Report No.: 8312314587****Page 1 of 22 Pages****Title: Test on Proximity Reader****Model: PRX30/3A**

Order placed by:	Synel Industries Ltd.
Address:	2 Hamada st. , P.O.B. 142, Yokneam 20692, Israel
Sample for test selected by:	The customer
The date of test:	21, 30/09/2003

Description of Equipment

Under Test (EUT):	Proximity Reader
Model:	PRX30/3A
Manufactured by:	Synel Industries Ltd.

Reference Standards:

- ❖ ETSI EN 300 330-2 V1.1.1 (06-2001) "Electromagnetic compatibility and radio spectrum matters (ERM); Short-range devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz"; Part 2: "Harmonized EN under Article 3.2 of the R&TTE Directive"
- ❖ EN 55022: "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurements" (1998).

Test Results:

The EUT meets the relevant requirements of the following standards:
ETSI EN 300 330-1:

- Sec. 5.3. "Normal test conditions" &
- Sec. 5.4 "Extreme test conditions";
- Sec. 7.2.1. "H-field (radiated)";
- Sec. 7.4.3. "Radiated field strength";

EN 55022 Radiated Emission Class B.

This Test Report contains 22 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.
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1. EUT Description

Description of Equipment Under Test (EUT): Proximity Reader

Model: PRX30/3A

Manufactured by: Synel Industries Ltd.

The EUT is a PRX-30/3A Proximity card reader with a keyboard.

The EUT is configured around a basic transmitter operating at 125 kHz.

The EUT can operate in two modes:

- Key by key – each number is transmitted immediately.
- 4 Character pin code – accumulated 4 insertions transmits the complete number.

Dimensions: 13 x 4.3 x 2 cm.

Power Supply: 3 to 14 VDC.

EUT's views (front panel view and internal views) are presented in Photos #1 - #2 below.

The EUT belongs to RFID (RF Identification) proximity products.

The following products - PRX3, PRX30, PRX3A, PRX4 and PRX40 - have the same RF transmitter and receiver circuitry design and electronics.

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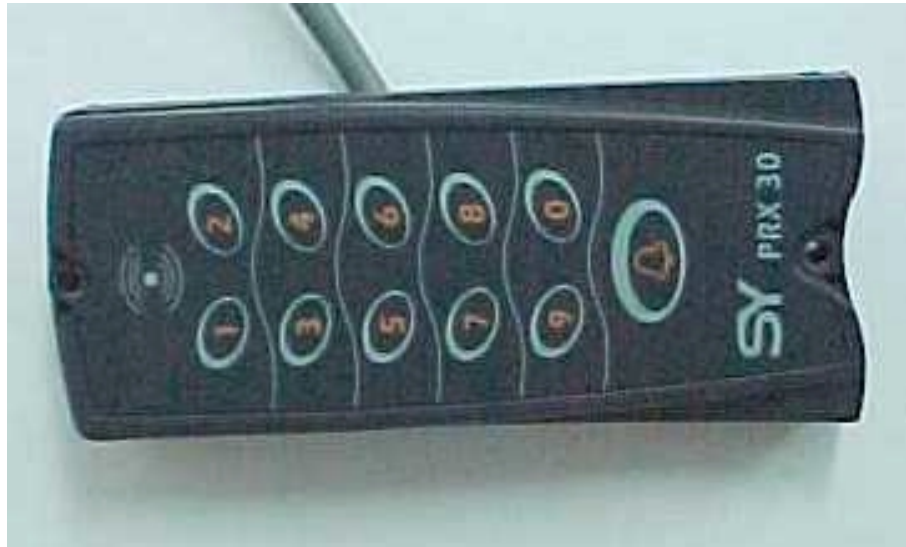


Photo # 1. EUT's front panel view

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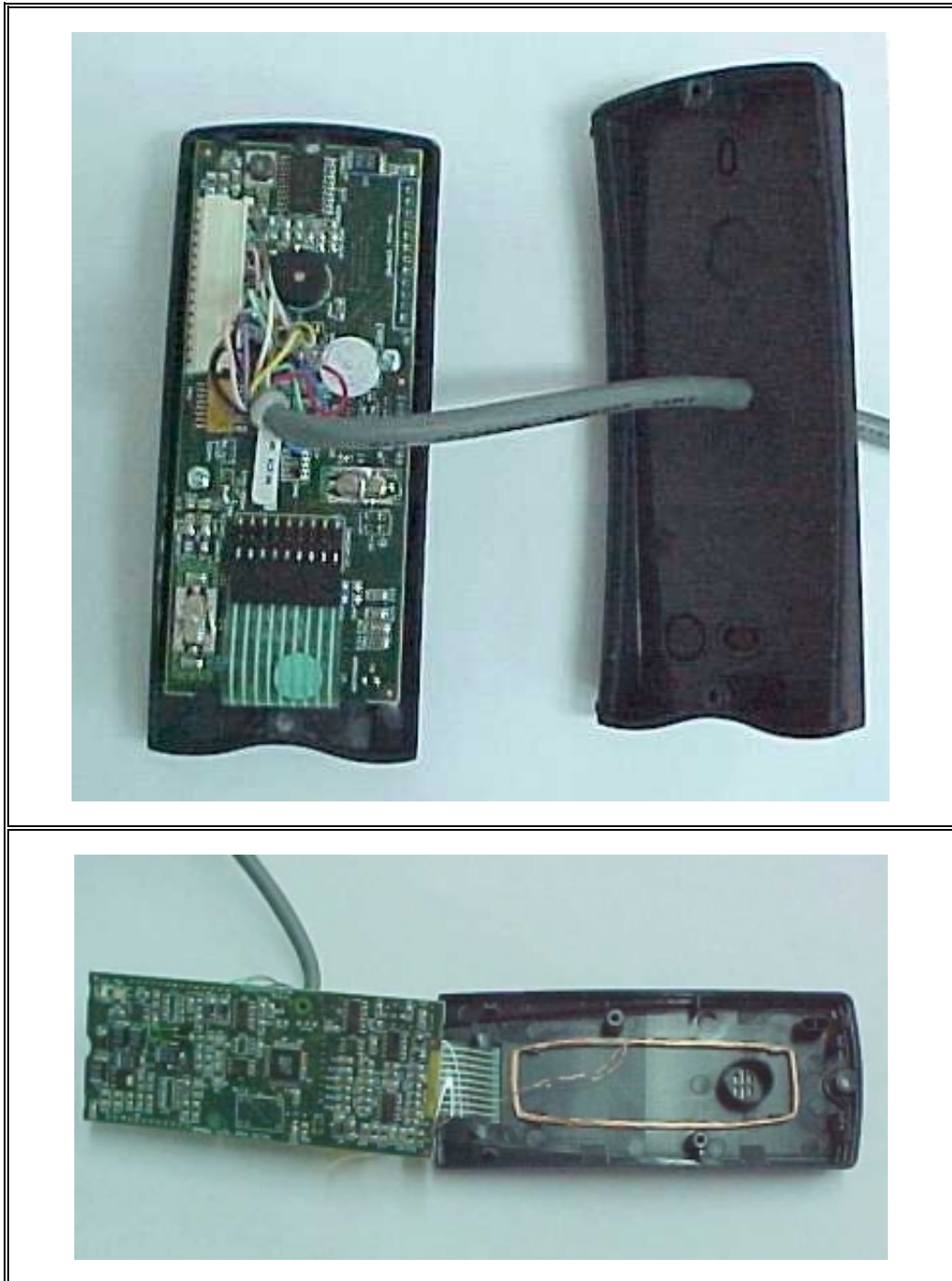


Photo # 2. EUT's internal views (PCB from both sides)



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2. Test specification, Methods and Procedures

Test Specification:

- ❖ ETSI EN 300 330-2 V1.1.1 (2001) “Electromagnetic compatibility and radio spectrum matters (ERM); Short-range devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz”; Part 2: “Harmonized EN under Article 3.2 of the R&TTE Directive”
- ❖ EN 55022: “Information technology equipment - Radio disturbance characteristics; Limits and methods of measurements” (1998).

Methods and Procedures:

- ❖ ETSI EN 300 330-1 V1.3.2 (2002) “Electromagnetic compatibility and radio spectrum matters (ERM); Short-range devices (SRD); Radio equipment in the frequency range 9 kHz to 25 MHz and inductive loop systems in the frequency range 9 kHz to 30 MHz”; Part 1: “Technical characteristics and test methods”.
 - Sec. 5.3. “Normal test conditions” &
 - Sec. 5.4 “Extreme test conditions”;
 - Sec. 7.2.1. “H-field (radiated)”;
 - Sec. 7.4.3. “Radiated field strength”;
- ❖ EN 55022: “Information technology equipment - Radio disturbance characteristics - Limits and methods of measurements” (1998), Sec. 6. “Limits for radiated disturbance”.

2.1. Test condition:

Temperature: 20 °C.

Humidity: 54 %.

Atmospheric pressure: 1008 mbar.



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3. Test description and results

3.1. Normal and extreme temperatures test:

3.1.1. Requirements:

(per Sec. 5.3 and 5.4)

3.1.2. Test procedure:

The EUT belongs to category I (General).

The measurements were conducted at the nominal temperature and humidity and then at the upper and lower temperatures of the range -20°C to $+55^{\circ}\text{C}$

Test was performed at upper & lower PS level 3-14 VDC .

The measurements were conducted in an oven. The EUT was left until thermal balance was attained (before tests at the high and low temperatures, respectively)

For high temperature test the EUT was switched on in the transmit condition of a half hour.

For low temperature test the EUT was switched on for period of a one minute.

3.1.3. Test results:

The test results are shown in Plots ## 1-2.

Plot # 1: red curve – normal conditions, blue - heating at $+55^{\circ}\text{C}$.

The frequency error = 0 kHz.

Delta of carrier strength: $< +0.5\text{ dB}$.

Plot # 2: red curve – normal conditions, blue – cooling at -20°C .

The frequency error = 0 kHz.

Delta of carrier strength: $< +2.0\text{ dB}$.

3.1.4. Test summary:

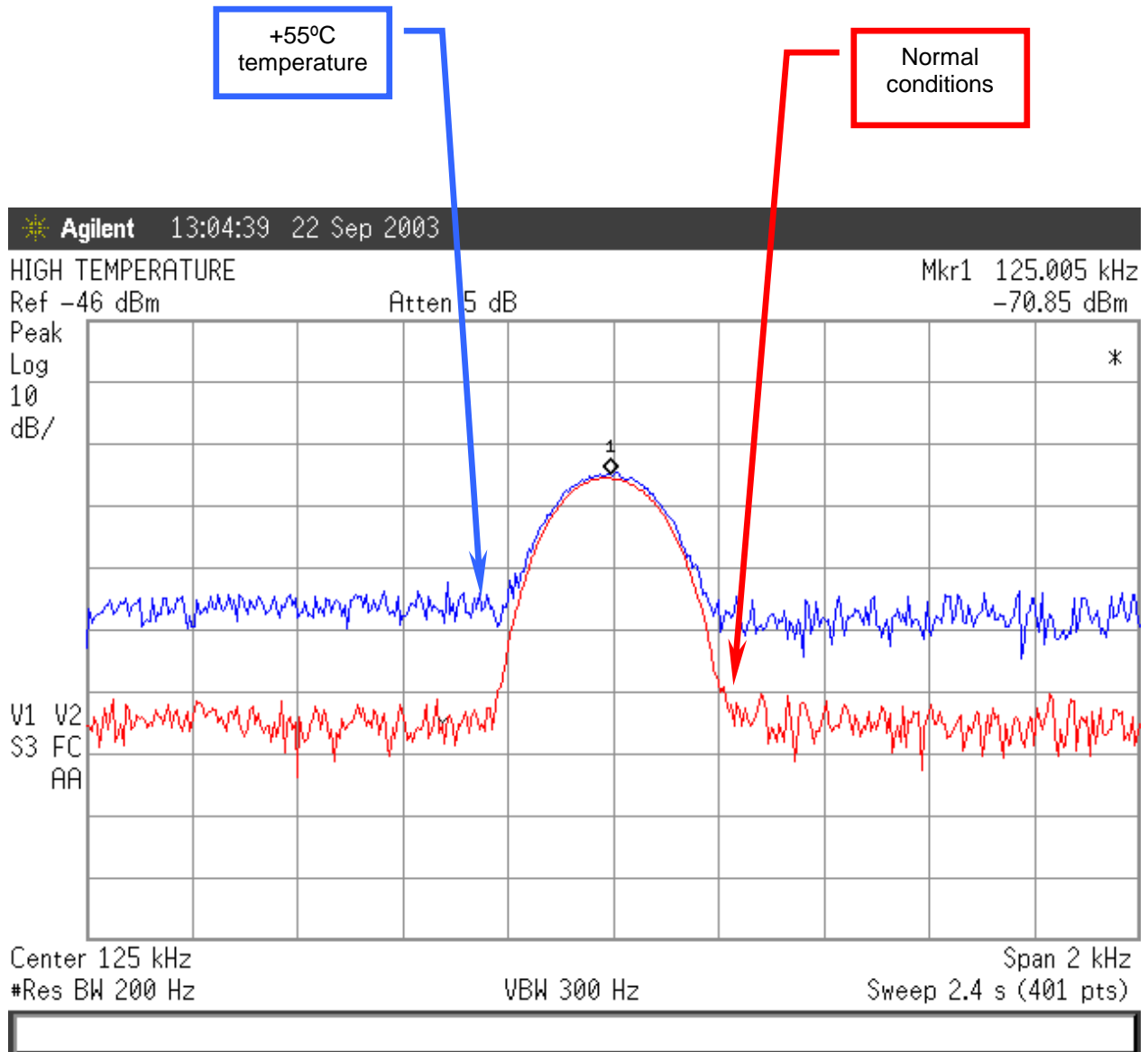
The tested unit meets the standard requirement.

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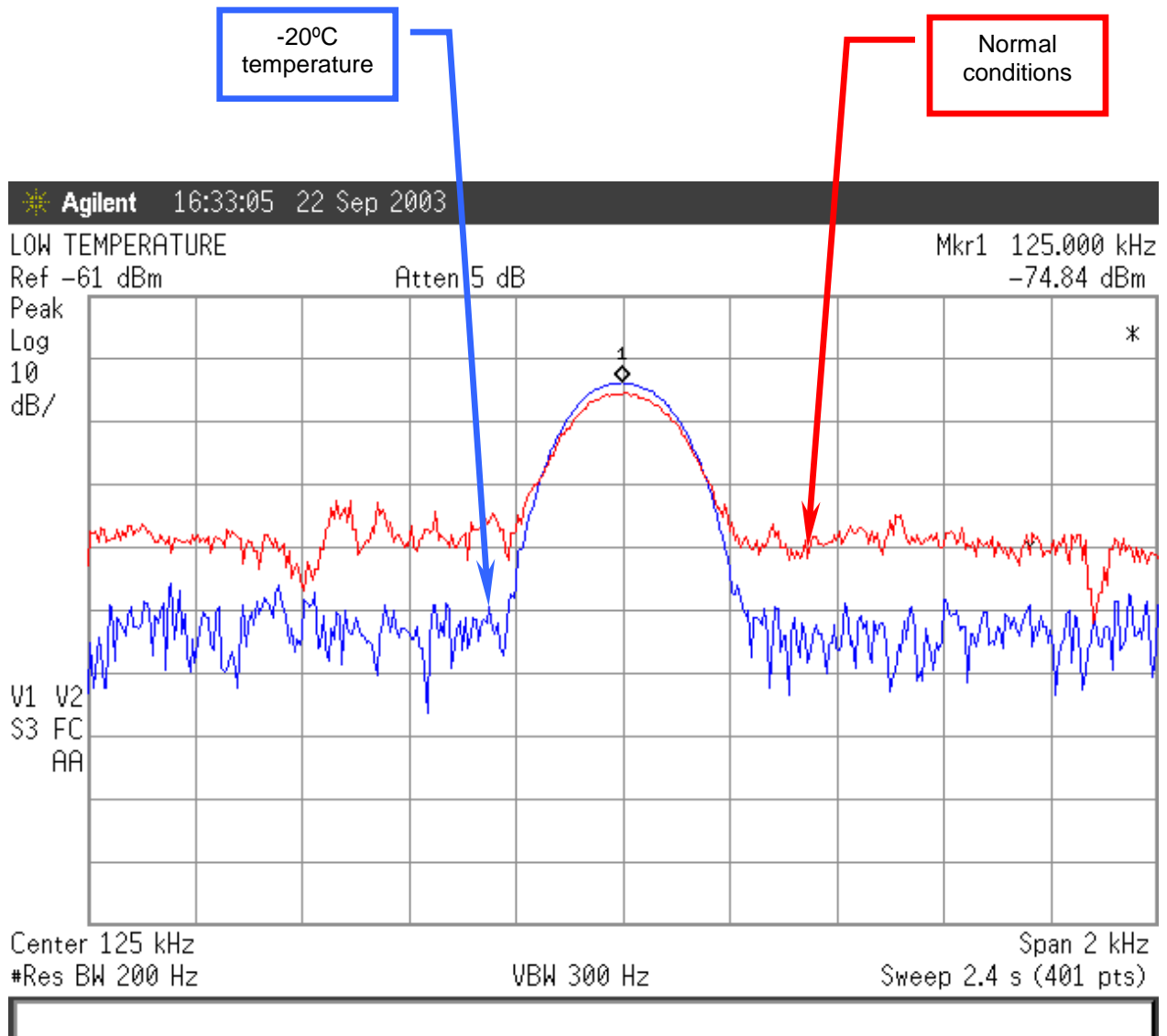
Plot # 1. High temperature test (55°C)

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Plot # 2. Low temperature test (-20°C)

3.2. H-field (radiated) test:

(per EN 300 330-1 Sec. 7.2.1).

Test was conducted in open site located in EMC lab, SII.

All measurements were performed at a 10 m measurement distance.

The photo of the test layout is presented in Appendix 3.

The transmitter was connected to Loop antenna model 6502 (Active Loop Antenna 10 kHz – 30 MHz) .

The measurements were conducted at the normal test conditions.

H-field strength limit for measuring bandwidth (frequency range) $0.119 \leq f < 0.135$ is 72 dB μ A/m at 10 m (see Table below).

**Table 1.
H-field limits at 10 m**

Frequency range (MHz)	H-field strength limit (H _f) dB μ A/m at 10 m
$0,009 \leq f < 0,03$	72 or according to note
$0,03 \leq f < 0,07$ $0,119 \leq f < 0,135$	72 at 0,03 MHz descending 3 dB/oct or according to note
$0,05975 \leq f < 0,08025$ $0,07 \leq f < 0,119$	42
$0,135 \leq f < 1,0$	37,7 at 0,135 MHz descending 3 dB/oct
$1,0 \leq f < 4,642$	29 at 1,0 MHz descending 9 dB/oct
$4,642 \leq f < 30$	9
$6,765 \leq f \leq 6,795$ $13,559 \leq f \leq 13,567$ $26,957 \leq f \leq 27,283$	42
NOTE:	For the frequency ranges 9 to 70 kHz and 119 to 135 kHz, the following additional restrictions apply to the higher limits: <ul style="list-style-type: none"> - for loop coil antennas with an area $\geq 0,16 \text{ m}^2$ table 2 applies directly; - for loop coil antennas with an area between $0,05 \text{ m}^2$ and $0,16 \text{ m}^2$ table 2 applies with a correction factor. The limit is: table value + $10 \times \log(\text{area}/0,16 \text{ m}^2)$; - for loop coil antennas with an area $< 0,05 \text{ m}^2$ the limit is 10 dB below table 2.

Loop coil area 3 cm x 9.5 cm = 0.0285 cm² less then 0.05 m². Accordingly, the limit decreases to 10 dB.

3.2.1. Test results:

The tested unit meets the standard requirement.

Test results are presented in Plot # 3 below.

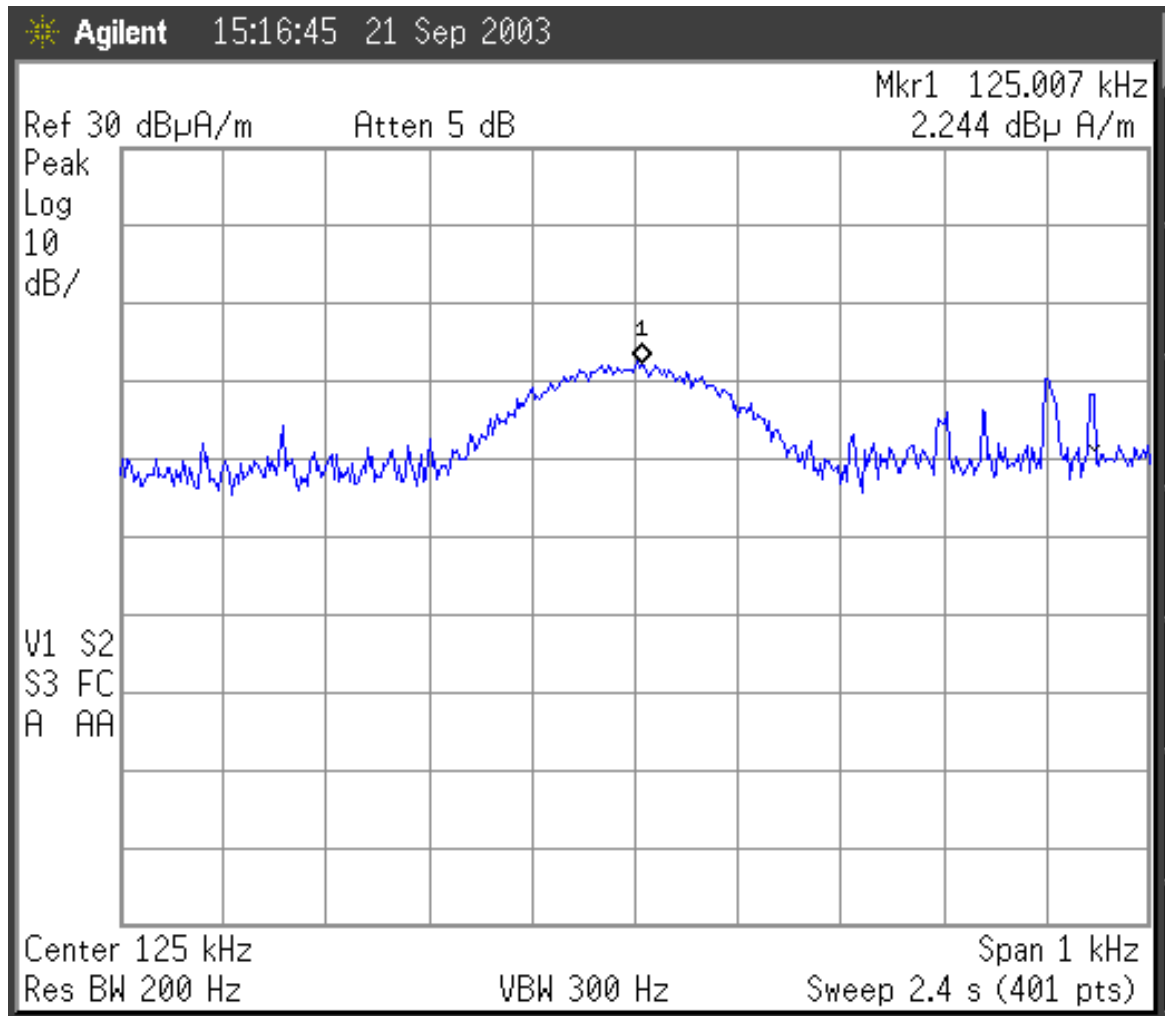


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Plot # 3. Carrier output level test

3.3. Spurious emission test (radiated field strength)

(per EN 300 330-1 Sec. 7.4.3).

The transmitter was connected to shielded antenna model 6502 (Active Loop Antenna 10 kHz – 30 MHz) .

Test frequency range: from 9 kHz to 1000 MHz, QP detector.

Tests were conducted twice: in open test site (OTS) at 10 m distance and again in an anechoic chamber at 3 m distance at the normal test conditions.

At each frequency at which a relevant spurious signal was detected, the EUT and the antenna were rotated at vertical axis until maximum field strength levels were noted.

Reference limits for transmit state are presented below:

- Frequency $9\text{kHz} \leq f < 10\text{ MHz}$: 27 dB $\mu\text{A}/\text{m}$ descending 3 dB/oct.
- Frequency $10\text{ MHz} \leq f < 30\text{ MHz}$: - 3.5 dB $\mu\text{A}/\text{m}$.

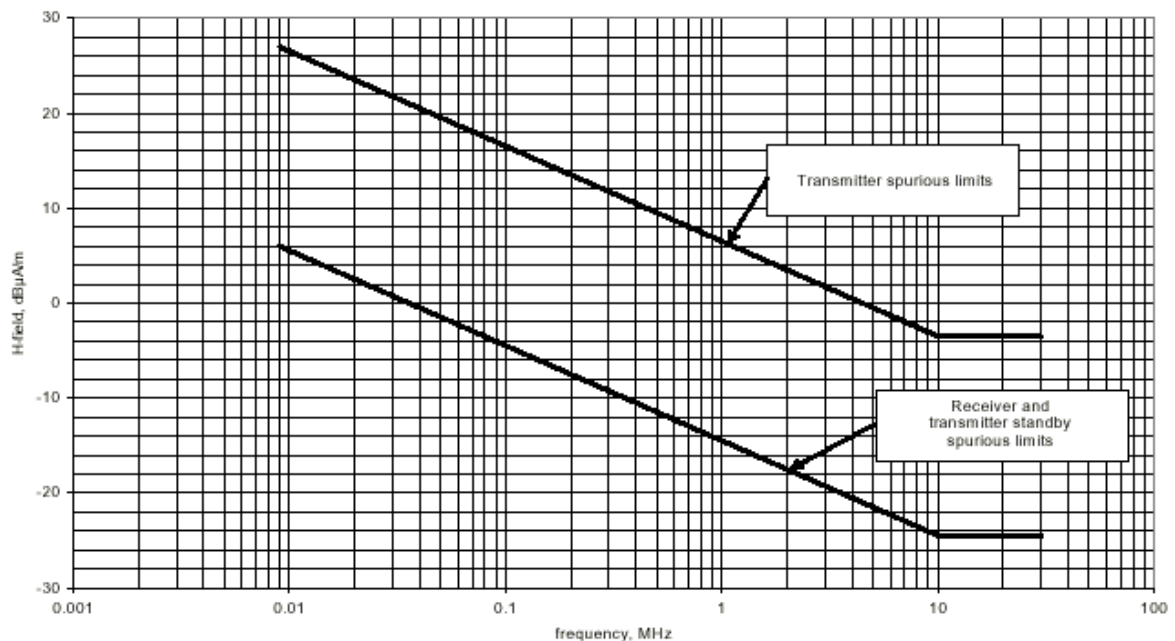


Figure 1. Spurious limits, Radiated H-fields at 10 m distance

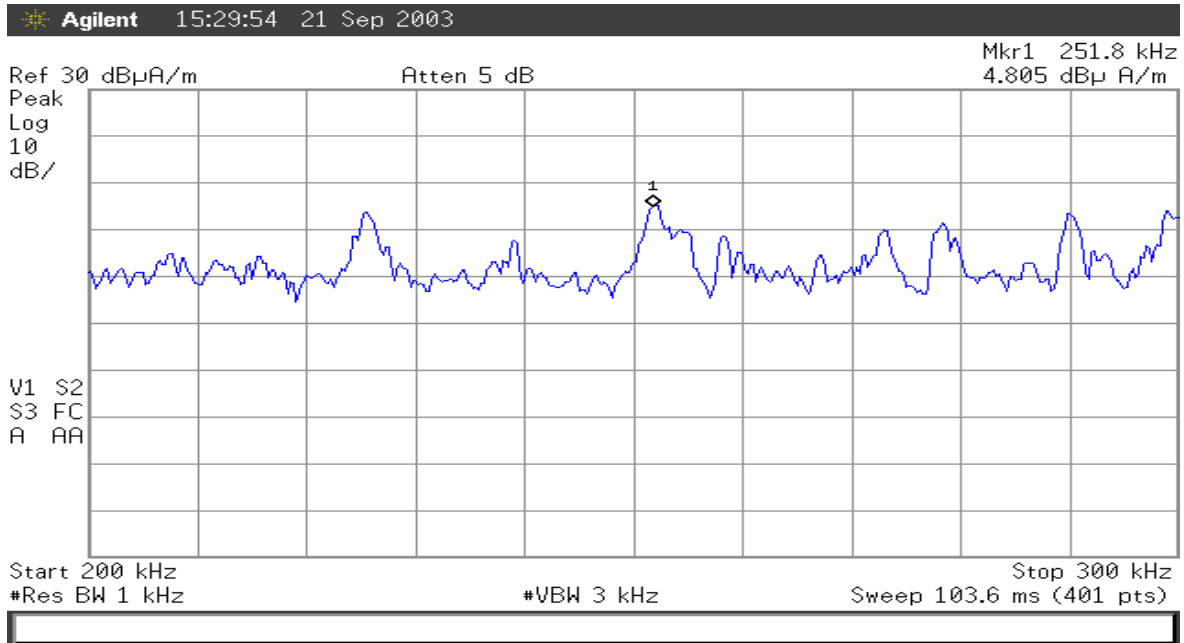
The tested unit meets the standard requirement.

Radiated emissions below 30 MHz are not exceed reference limit at 10 m.

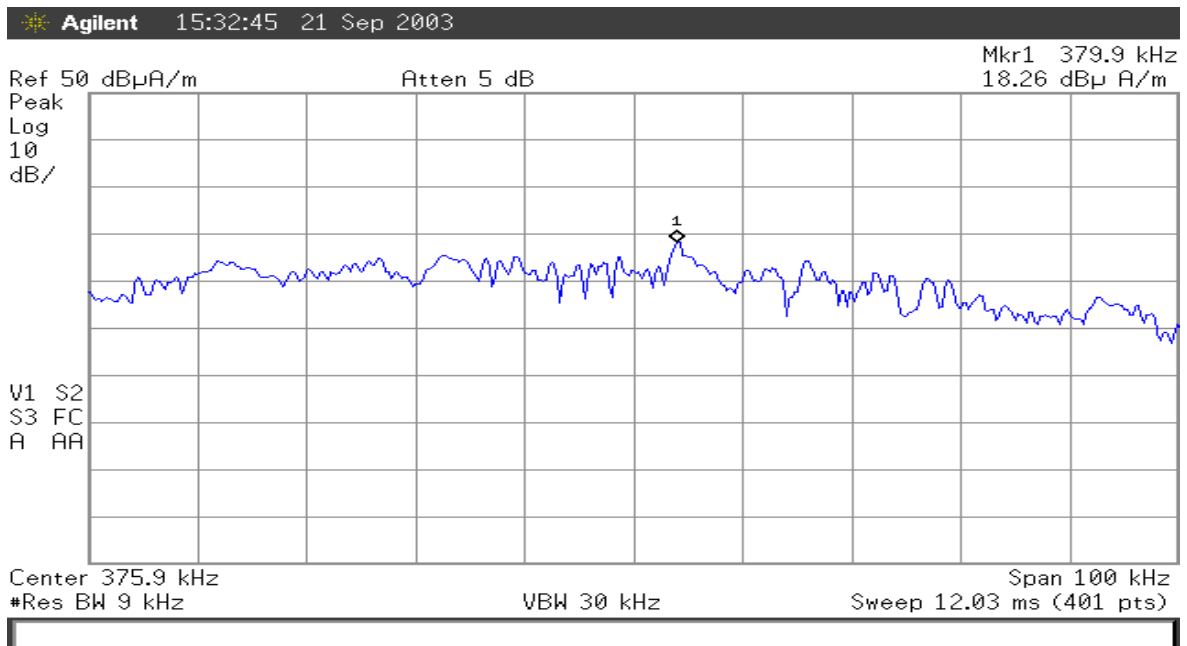
Plots ## 4 – 5 (for 10 m distance) and ## 6 - 7 (for 3 m distance) are presented below.



Spurious emission test results on OTS, 10 m distance



Plot # 4. 2nd harmonic test



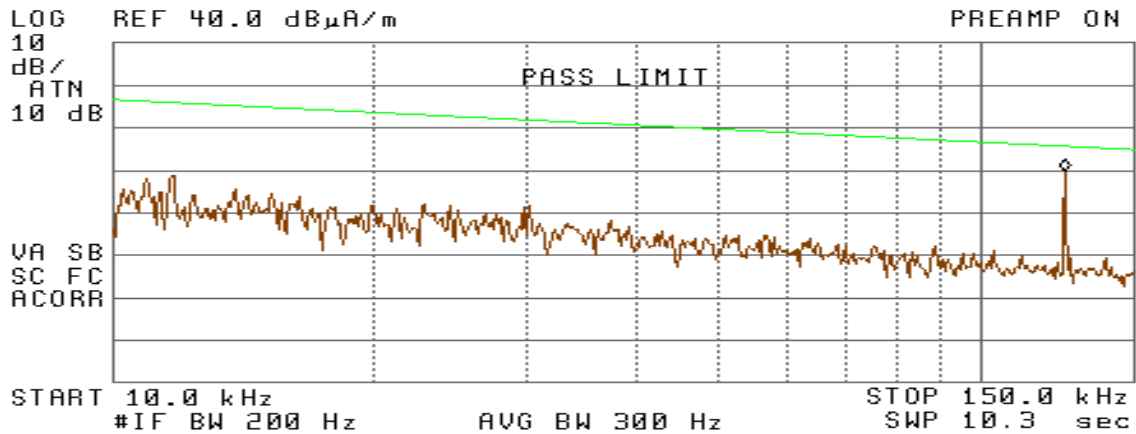
Plot # 5. 3^d harmonics test



Spurious emission test results on anechoic chamber, 3 m distance

19:02:27 SEP 22, 2003

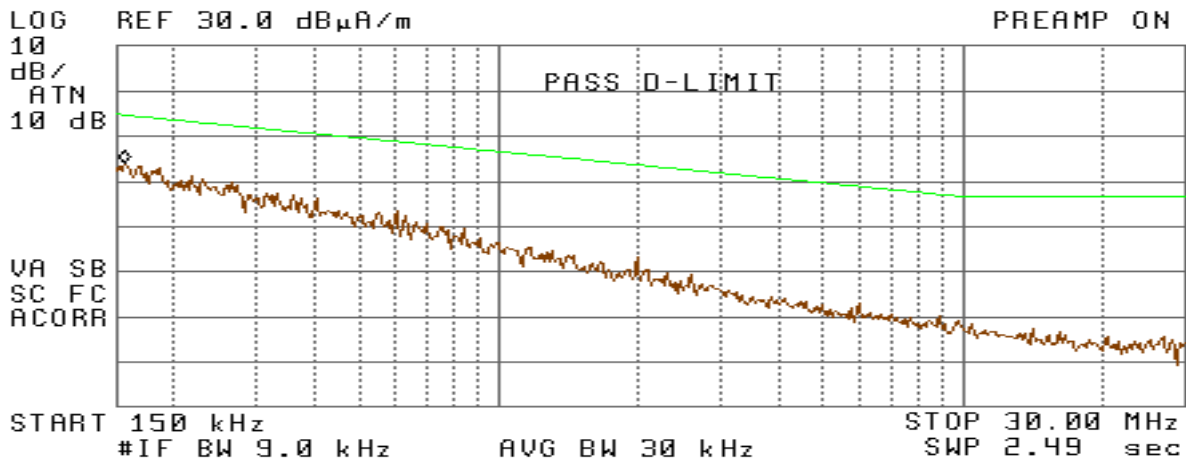
ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 124.7 kHz
9.71 dBµA/m



Plot # 6. Frequency range from 10 kHz to 150 kHz

19:07:23 SEP 22, 2003

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKR 150 kHz
3.83 dBµA/m



Plot # 7. Frequency range from 150 kHz to 30 MHz



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3.4. Radiated emission test:

(per EN 55022 Sec. 6).

3.4.1. Preliminary radiated emission tests:

Preliminary radiated measurements were performed in a semi-anechoic chamber at a distance of 3 meters.

The EUT was setup in its typical configuration and operated in its various modes.

For each mode of operation the frequency spectrum was monitored.

EUT configuration, cable configuration and mode of operation, which produced the maximum level of emission, were documented. A list of frequencies to be tested was prepared.

3.4.2. Final measurements:

The final radiated measurements were performed at the Open Area Test Site located at Kibbutz Native Halamed Hai in Emek HaEla, Israel.

The EUT was arranged on a non-metallic table 0.8 m placed on the turntable.

The Photo # of the test layout is presented in Appendix 3.

All measurements at the Open Area Test Site were performed at a 10 m measurement distance.

The Biconilog 30 MHz-2 GHz antenna was used.

The EUT's configuration and mode of operation, which produced the maximum level of emissions, were selected.

The Frequency range from 30 to 1000 MHz was investigated.

The measurements were performed at each frequency found previously and at frequencies 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-to-EUT polarization from vertical to horizontal.

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Unless stated otherwise, 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 2).

2 ferrite beads P/N 0443164251 mfr Feir-Rait were installed on EUT's cable (see Photo #).

3.4.3. Radiated emission test results:

Test results are presented in Table 2 below

Table 2. Radiated emission test results**Ref. Limits: EN 55022 Class B**

Frequency (MHz)	Turn- table Angle (°)	Antenna Polariz.	Antenna Height (m)	Emission Level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Results
440.1	280	H	2.00	32.7	37.0	4.3	Complies
441.7	52	H	2.00	33.0	37.0	4.0	Complies
444.5	280	H	2.00	32.5	37.0	4.5	Complies
446.7	276	H	2.00	28.4	37.0	8.6	Complies
453.4	260	H	2.00	26.7	37.0	10.3	Complies

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

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4. Test summary

Parameter	Ref. standard	Comply/not comply with the requirements
Normal temperature test Extreme temperature test	ETSI EN 300 330-1 Sec. 5.3 Sec. 5.4	Comply
H-field (radiated) emission	ETSI EN 300 330-1 Sec.7.2.1	Comply
Spurious emissions (radiated field strength)	ETSI EN 300 330-1 Sec.7.4.3	Comply
Radiated emission	EN 55022 Sec. 6 Class B	Comply

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30 September 2003

Tested by: Albert Herzenshtein
Position: Test Engineer

Name: Michael Feldman
Position: Testing Engineer

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5. Appendix 1: Test equipment used

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

EN 55022

Instrument	Manufacturer	Model	Serial No.	Last calibration date	Next calibration date
EMI Receiver	HP	8546A+85460A	SII 4068	11/02	11/03
LISN 9 kHz – 30 MHz	FCC	LISN- 50/250-32-4-16	SII 5023	05/03	05/04
Transient limiter 0.009-200 MHz	HP	11947A	31074A3105	05/03	05/04
Antenna Biconilog 30 – 2000 MHz	Schaffner- Chase	CBL6112B	S/N 2531	01/03	01/04
Antenna Mast	R&S	HCM	100002	N/A	N/A
Metallic turntable	R&S	HCT12	100001	N/A	N/A
Positioning controller	R&S	HCC	100002	N/A	N/A

ETSI EN 300 330-1

Instrument	MFR	Model	Serial No.	Last calibration date	Next calibration date
EMI Receiver 10 kHz – 26.5 GHz	HP	E7405A	SII 4944	01/03	01/04
Active Loop Antenna	EMCO	6502	3283	10/02	10/03
Temperature/Humidity cabinet	Weiss Technik	SB22/160/40	SII 4081	06/03	06/04
Power supply	Horizon	DHR3655D-10	-	NA	NA

6. Appendix 2: 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



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Table 3. Antenna Factor

For Biconilog Antenna, Model Number: CBL-6112B, S/N: 3283
10 m Calibration

Horizontal Polarization				Vertical Polarization			
Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)	Frequency (MHz)	Antenna Factor (dB/m)
30	19.7	725	19.7	30	17.6	725	19.8
40	13.8	750	20.1	40	16.1	750	20.0
50	8.5	775	20.1	50	8.2	775	20.0
60	6.3	800	20.1	60	6.0	800	20.1
70	6.4	825	20.3	70	6.2	825	20.3
80	7.2	850	20.5	80	7.7	850	20.6
90	9.1	875	20.7	90	9.2	875	20.8
100	10.8	900	20.7	100	10.6	900	20.9
110	11.7	925	20.9	110	11.4	925	21.0
120	12.0	950	21.0	120	11.7	950	21.2
130	11.8	975	21.4	130	11.8	975	21.3
140	11.3	1000	21.5	140	11.3	1000	21.4
150	10.5	1050	22.0	150	10.4	1050	21.9
160	10.0	1100	22.2	160	9.8	1100	22.2
170	9.6	1150	22.7	170	9.4	1150	22.6
180	9.2	1200	23.2	180	9.4	1200	23.1
190	9.0	1250	23.6	190	9.6	1250	23.5
200	9.3	1300	24.0	200	9.9	1300	23.8
225	9.8	1350	24.1	225	10.5	1350	24.0
250	12.7	1400	24.6	250	12.6	1400	24.3
275	12.9	1450	24.9	275	13.2	1450	24.7
300	13.3	1500	25.1	300	13.4	1500	25.0
325	13.8	1550	25.2	325	13.8	1550	25.2
350	14.6	1600	25.4	350	14.6	1600	25.3
375	15.0	1650	25.9	375	15.1	1650	25.8
400	15.9	1700	26.1	400	16.0	1700	26.0
425	16.6	1750	26.4	425	16.7	1750	26.2
450	16.8	1800	26.4	450	16.7	1800	26.4
475	17.5	1850	26.7	475	17.4	1850	26.7
500	17.7	1900	27.3	500	17.7	1900	27.3
525	18.0	1950	27.6	525	18.0	1950	27.3
550	19.3	2000	27.6	550	19.1	2000	27.7
575	19.4			575	19.1		
600	19.3			600	19.3		
625	19.7			625	19.5		
650	19.6			650	19.5		
675	19.5			675	19.5		
700	19.4			700	19.5		

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Table 4. Antenna Factor
For Active Loop Antenna, Model 6502, S/N: 2531

Frequency (MHz)	Magnetic Antenna Factor (dBS/m)	Electric Antenna Factor (dB)
0.009	-31.9	19.6
0.010	-32.8	18.7
0.020	-36.9	14.6
0.050	-39.1	12.4
0.075	-39.5	12.1
0.100	-39.5	12.0
0.150	-39.6	11.9
0.250	-39.8	11.8
0.500	-39.9	11.7
0.750	-40.0	11.6
1.000	-39.9	11.7
2.000	-40.2	11.3
3.000	-40.5	11.0
4.000	-40.5	11.0
5.000	-40.7	10.9
10.000	-41.4	10.1
15.000	-41.7	9.9
20.000	-42.1	9.5
25.000	-43.0	8.5
30.000	-44.1	7.5

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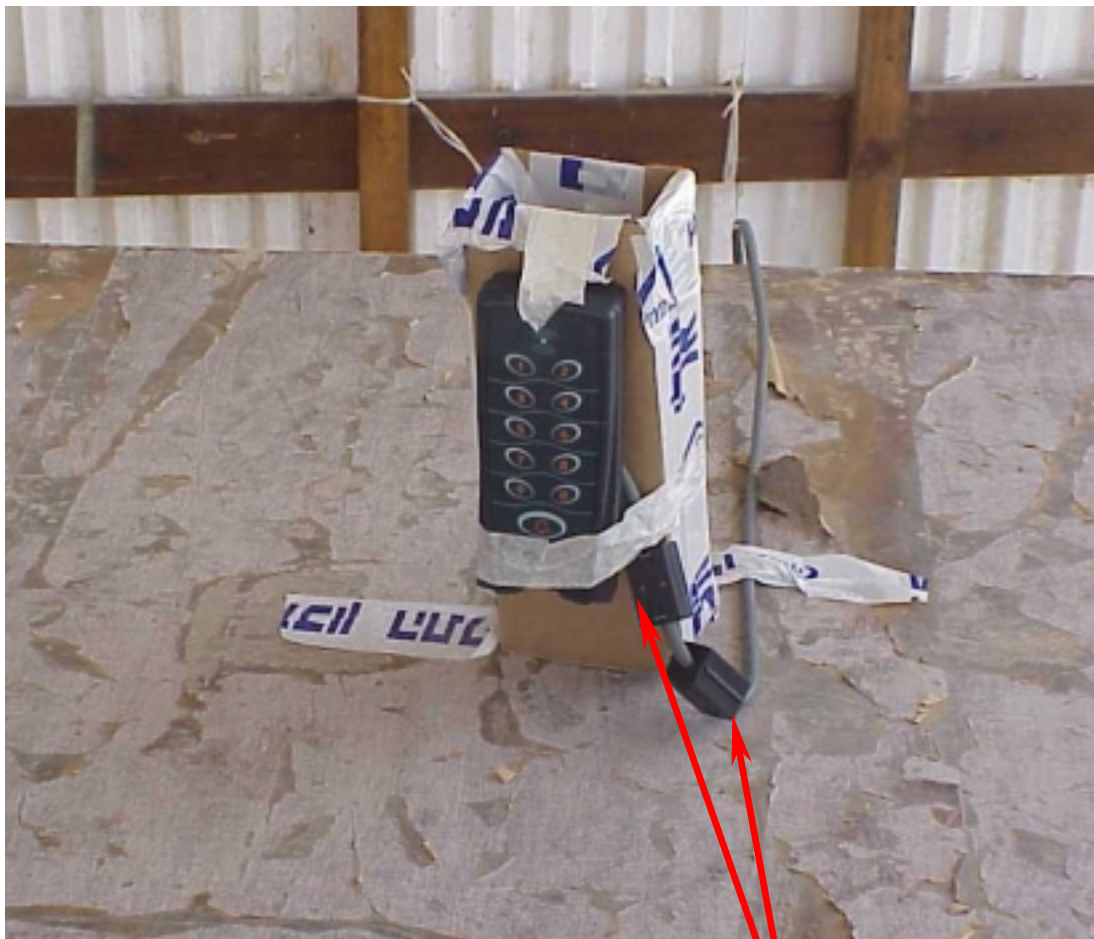
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7. Appendix 3: Test configuration illustrations

This appendix contains the following illustrations:



Ferrite beads
P/N 0443164251

Photo # 3. Radiated emission test setup. Front view