



DATE: 26 November 2013

I.T.L. (PRODUCT TESTING) LTD.
FCC Radio Test Report
for
Hi-G-Tek Ltd.

Equipment under test:

SPDS Seal

IGSPV40916/IGSBV40916*

125 kHz Transmitter

Written by: Ronit Pinchuck
R. Pinchuck, Documentation

Approved by: A. Sharabi
A. Sharabi, Test Engineer

Approved by: I. Raz
I. Raz, EMC Laboratory Manager

This report must not be reproduced, except in full, without the written permission of I.T.L. (Product Testing) Ltd.

This report relates only to items tested.

*See Customer's Declaration on Page 5



Measurement/Technical Report for Hi-G-Tek Ltd.

Equipment under test:

SPDS Seal

FCC ID: OB6-IGSV40916

26 November 2013

This report concerns: Original Grant: X
 Class I change:
 Class II change:

Equipment type: Part 15 Low Power Transmitter Below 1705 kHz

Limits used: 47CFR15 Section 15.209

Measurement procedure used is KDB 558074 D01 April 9, 2013 and
ANSI C63.4-2003.

Application for Certification
prepared by:
Ronit Pinchuck
ITL (Product Testing) Ltd.
1 Bat-Sheva Street
Lod 7116002
Israel
Tel: +972-8-918-6117
Fax: +972-8-915-3101
Email: rpinchuck@itl.co.il

Applicant for this device:
(different from "prepared by")
Yossi Hershko
Hi-G-Tek Ltd.
16 Hacharoshet St.
Or Yehuda 60375
Israel
Tel: +972-3-533-9359
Fax: +972-3-533-8225
Email: yossih@higtek.com



TABLE OF CONTENTS

1. GENERAL INFORMATION -----	4
1.1 Administrative Information.....	4
1.2 Abbreviations and Symbols.....	6
1.3 List of Accreditations	7
1.4 Product Description	8
1.5 Test Methodology.....	8
1.6 Test Facility	8
1.7 Measurement Uncertainty	8
2. SYSTEM TEST CONFIGURATION-----	9
2.1 Justification.....	9
2.2 EUT Exercise Software	9
2.3 Special Accessories	9
2.4 Equipment Modifications	9
2.5 Configuration of Tested System.....	9
4. FIELD STRENGTH OF FUNDAMENTAL 125 KHZ TRANSMITTER -----	12
4.1 Test Specification	12
4.2 Test Procedure	12
4.3 Measured Data.....	12
4.4 Test Instrumentation Used, Field Strength of Fundamental	14
5. SPURIOUS RADIATED EMISSION, 9 KHZ – 30 MHZ, 125 KHZ TRANSMITTER-----	15
5.1 Test Specification	15
5.2 Test Procedure	15
5.3 Measured Data.....	15
5.4 Test Instrumentation Used, Radiated Measurements.....	17
5.5 Field Strength Calculation	17
6. SPURIOUS RADIATED EMISSION 30-1000 MHZ, 125 KHZ TRANSMITTER -----	18
6.1 Test Specification	18
6.2 Test Procedure	18
6.3 Test Data.....	18
6.4 Test Instrumentation Used, Radiated Measurements.....	19
7. BANDWIDTH FOR 125 KHZ TRANSMITTER -----	20
7.1 Test Specification	20
7.2 Test procedure	20
7.3 Test Results.....	20
7.4 Test Equipment Used.....	21
8. ANTENNA GAIN/INFORMATION -----	22
9. APPENDIX A - CORRECTION FACTORS -----	23
9.1 Correction factors for CABLE	23
9.2 Correction factors for BICONICAL ANTENNA	24
9.3 Correction factors for ACTIVE LOOP ANTENNA	25



1. General Information

1.1 Administrative Information

Manufacturer: Hi-G-Tek Ltd.

Manufacturer's Address: 16 Hacharoshet St.
Or-Yehuda 60375
Israel
Tel: +972-3-533-9359
Fax: +972-3-533-9225

Manufacturer's Representative: Roni Cohen

Equipment Under Test (E.U.T): SPDS Seal

Equipment Model No.: IGSPV40916/IGSBV40916

Equipment Serial No.: Not Designated

Date of Receipt of E.U.T: 21.08.2013

Start of Test: 21.08.2013

End of Test: 21.08.2013

Test Laboratory Location: I.T.L (Product Testing) Ltd.
Kfar Bin Nun,
ISRAEL 99780

Test Specifications: FCC Part 15, Subpart C,



Wireless Monitoring Platform
for Security & Management

November 13, 2013

DECLARATION

I HEREBY DECLARE THAT THE DIFFERENCES BETWEEN THE FOLLOWING
PRODUCT(S):

**SPDS Seal IG-SPV-40-916 and
SPDS Seal IG-SBV-40-916**

ARE AS FOLLOWS:

**SPDS Seal IG-SBV-40-916 – THE ADAPTER HAS 3 INPUTS AND INTERNAL REED
SWITCH**

**SPDS Seal IG-SPV-40-916- THE ADAPTER HAS ONE INPUT, ONE OUTPUT AND
INTERNAL REED SWITCH**

Please relate to them all (from an EMC point of view) as the same
product.

Thank you,
Signature:



**Roni Cohen
HW Development Manager
Hi-G-Tek Ltd.**



1.2 Abbreviations and Symbols

The following abbreviations and symbols are applicable to this test report:

A/m	ampere per meter
AC	alternating current
AM	amplitude modulation
ARA	Antenna Research Associates
Aux	auxiliary
Avg	average
CDN	coupling-decoupling network
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
db μ V	decibel referred to one microvolt
db μ V/m	decibel referred to one microvolt per meter
DC	direct current
EFT/B	electrical fast transient/burst
EMC	electromagnetic compatibility
ESD	electrostatic discharge
E.U.T.	equipment under test
GHz	gigahertz
HP	Hewlett Packard
Hz	Hertz
kHz	kilohertz
kV	kilovolt
LED	light emitting diode
LISN	line impedance stabilization network
m	meter
mHn	millihenry
MHz	megahertz
msec	millisecond
N/A	not applicable
per	period
QP	quasi-peak
PC	personal computer
RF	radio frequency
RE	radiated emission
sec	second
V	volt
V/m	volt per meter
VRMS	volts root mean square



1.3 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.



1.4 Product Description

The SPDS Seal is a portable, reusable electronic seal that provides automatic processing and real-time monitoring of secured cargoes in transit and in storage. The SPDS Seal uses active RFID (Radio Frequency Identification) wireless monitoring technology and includes a transmitter/receiver unit, read/ write capability, real-time clock, memory and sensing circuitry for sealing verification. The SPDS Seal, together with mounting fixture, form the complete assembly used in most applications. The system detects any such attempt, sends an alert and records the event. In low frequency, short range mode, the SPDS Seal logs and communicates data through a handheld data terminal and can be inspected by a MicroReader. The data terminal writes the electronic manifest of the sealed cargo into the electronic seal's memory. The information can include the vehicle ID, container and invoice numbers, cargo descriptions, quantities and destinations. The high-frequency, long range mode provides full two-way, read/write data communication capabilities at a distance of 50m. The SPDS Seal transmits the information in reply to an interrogation by the AVL Reader.

1.5 Test Methodology

Radiated testing was performed according to the procedures in KDB 558074 D01 April 9, 2013 and ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.6 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 3, 2009).

I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.7 Measurement Uncertainty

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 4.96 dB



2. System Test Configuration

2.1 ***Justification***

Model IGSPV40916 differs from Model IGSBV40916 by additional digital components connected to the unit sensor.

During testing the IGSPV40916 was tested as worst case.

2.2 ***EUT Exercise Software***

No exercise software was used during testing.

2.3 ***Special Accessories***

No special accessories were needed to achieve compliance.

2.4 ***Equipment Modifications***

No special modifications were needed to achieve compliance.

2.5 ***Configuration of Tested System***

The configuration of the tested system is described below.

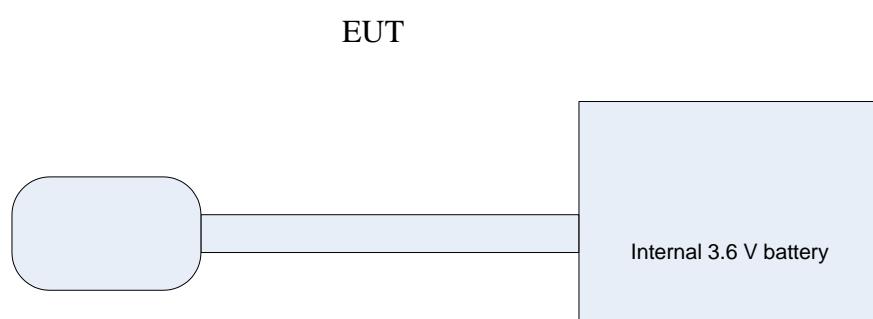


Figure 1. Configuration of Tested System

3. Radiated Measurement Test Set-up Photos



Figure 2. Radiated Emission Test



Figure 3. Radiated Emission Test



Figure 4. Radiated Emission Test



Figure 5. Radiated Emission Test



4. Field Strength of Fundamental 125 kHz Transmitter

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (125 kHz) and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

The average result is:

Peak Level (dB μ V/m) + Average Factor (dB)

4.3 Measured Data

JUDGEMENT: Passed by 35.49dB

The EUT met the FCC Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 6*.

TEST PERSONNEL:

Tester Signature: 

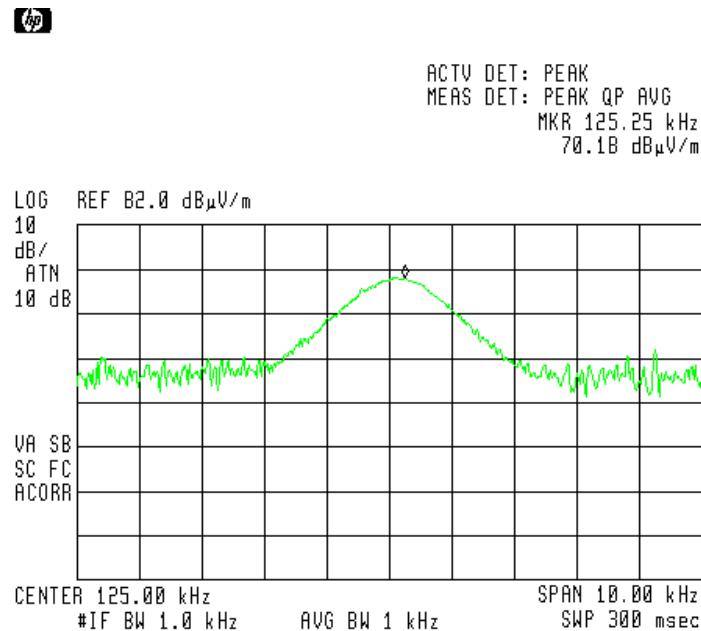
Date: 09.12.13

Typed/Printed Name: A. Sharabi



Field Strength of Fundamental

E.U.T Description SPDS Seal
Type IGSPV40916/IGSBV40916
Serial Number: Not Designated



**Figure 6. Field Strength of Fundamental.
Detector: Peak**

Average Limit = 105.67dB μ V/m



4.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 21, 2012	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A



5. Spurious Radiated Emission, 9 kHz – 30 MHz, 125 kHz Transmitter

5.1 **Test Specification**

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

5.2 **Test Procedure**

The E.U.T. operation mode and test set-up are as described in Section 3.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 10 meters.

The E.U.T. was operated at the frequency of 125 kHz. This frequency was measured using a peak detector.

5.3 **Measured Data**

JUDGEMENT: PASSED

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature: 

Date: 09.12.13

Typed/Printed Name: A. Sharabi



Radiated Emission, 9 kHz-30 MHz

E.U.T Description SPDS Seal
Type IGSPV40916/IGSBV40916
Serial Number: Not Designated

Specification: FCC Part 15, Subpart C, Section 209

Antenna: 3 meters distance Frequency range: 9 kHz to 30 MHz
Detectors: Peak, Average

Frequency (MHz)	Peak Amp (dB μ V/m)	Peak Specification (dB μ V/m)	Margin (dB)
0.250	33.0	99.65	-66.65
0.375	33.0	96.12	-63.12
0.500	33.0	74.00	-41.00

Figure 7. Radiated Emission. Detectors: Peak, Quasi-peak

Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.



5.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 21, 2012	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

5.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ V/m]
RA: Receiver Amplitude [dB μ V]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

Example: $FS = 30.7 \text{ dB}\mu\text{V (RA)} + 14.0 \text{ dB (AF)} + 0.9 \text{ dB (CF)} = 45.6 \text{ dB}\mu\text{V}$

No external pre-amplifiers are used.



6. Spurious Radiated Emission 30-1000 MHz, 125 kHz transmitter

6.1 ***Test Specification***

30 - 1000 MHz, F.C.C., Part 15, Subpart C

6.2 ***Test Procedure***

The E.U.T. operation mode and test set-up are as described in Section 3. See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 1. The signals from the list of the highest emissions were verified and the list was updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The emissions were measured at a distance of 3 meters.

6.3 ***Test Data***

JUDGEMENT: PASSED

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

No signals were detected in the frequency range of 30 -1000 MHz.

TEST PERSONNEL:

Tester Signature: 

Date: 09.12.13

Typed/Printed Name: A. Sharabi



6.4 ***Test Instrumentation Used, Radiated Measurements***

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Antenna Biconical	EMCO	3104	2606	August 30, 2012	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

7. Bandwidth for 125 kHz Transmitter

7.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.249(a)

7.2 Test procedure

The transmitter unit operated with normal modulation. The spectrum analyzer was set to 1 kHz resolution BW and center frequency of the transmitter fundamental. The spectrum bandwidth of the transmitter unit was measured and recorded. The BW was measured at 26dBc points.

The EUT was set up as shown in Figure 1 and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on the modulation envelope.

7.3 Test Results

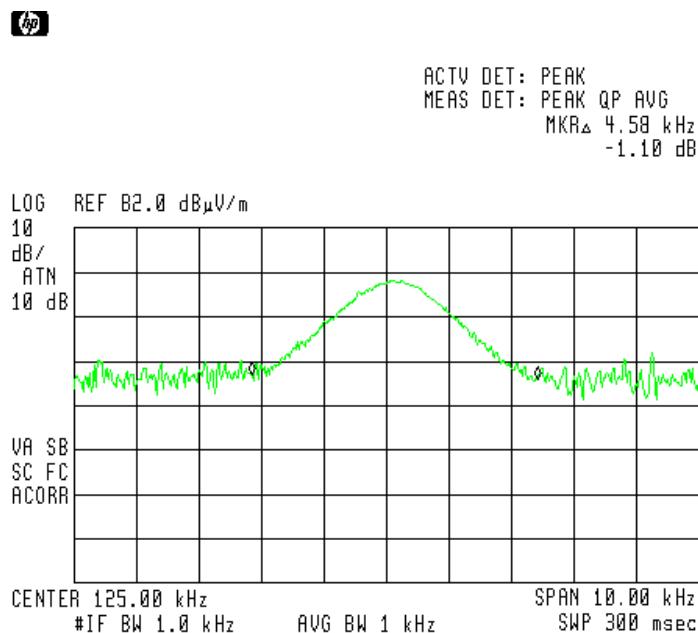


Figure 8 Bandwidth Test results Table

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: 

Date: 09.12.13

Typed/Printed Name: A. Sharabi



7.4 **Test Equipment Used.**

Bandwidth for 125 kHz Transmitter

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	8546A	3650A00365	March 17, 2013	1 Year
Active Loop Antenna	EMCO	6507	1448	April 21, 2013	1 Year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

Figure 9 Test Equipment Used



8. Antenna Gain/Information

The antenna gain is 0 dBi, integral.



9. APPENDIX A - CORRECTION FACTORS

9.1 *Correction factors for CABLE from EMI receiver to test antenna at 3 meter range.*

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".



9.2 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.
2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".



9.3 Correction factors for ACTIVE LOOP ANTENNA

**Model 6502
S/N 9506-2950**

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2