ELECTROMAGNETIC EMISSIONS TEST REPORT

ACCORDING TO FCC PART 15, SUBPART C, §15.231

FOR

VISONIC Ltd.

EQUIPMENT UNDER TEST

WIRELESS PIR MOTION DETECTOR,
models K-980W and LEGACY

Prepared by: _____
Mrs. M. Cherniavsky, certif. engineer
Hermon Labs

Approved by: _____
Mr. A. Usoskin, QA manager
Hermon Labs

Approved by: _____
Dr. E. Usoskin, C.E.O.
Hermon Labs

Approved by: _____
Mr. Arick Elshtein, technical support manager
Visonic Ltd.

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ACCREDITED
ELECTRICAL

Description of equipment under test

Test items	Remote control transmitter, FCC ID:GSAK980W
Manufacturer	Visonic Ltd.
Trade Mark	Visonic Ltd.
Type (Model)	K980W, LEGACY
Serial number	81083104

Applicant information

Applicant's representative & responsible person	Mr. Arick Elshtein, technical support manager
Company	Visonic Ltd.
Address	30 Habarzel St.
P.O. Box	22020
Postal code	61220
City	Tel Aviv
Country	Israel
Telephone number	+972 3645 6714
Telefax number	+972 3645 6789

Test performance

Project Number	13508
Location of the test	Hermon Laboratories, Binyamina, Israel
Test started	June 27, 1999
Test completed	June 27, 1999
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC part 15 subpart C §15.231, §15.209 subpart B, §15.109

The A2LA logo endorsement applies only to the test methods and the standards that are listed in the scope of Hermon Laboratories accreditation by A2LA.
Through this report a point is used as decimal separator while thousands are separated by comma.
This report is in conformity with EN 45001 and ISO GUIDE 25.
The test results relate only to the items tested.

Table of Contents

1 General information

1.1 Abbreviations and acronyms

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

AM	amplitude modulation
AVRG	average (detector)
BW	bandwidth
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
DC	direct current
EMC	electromagnetic compatibility
EUT	equipment under test
GHz	gigahertz
H	height
HL	Hermon Laboratories
Hz	hertz
IF	intermediate frequency
kHz	kilohertz
L	length
m	meter
mm	millimeter
MHz	megahertz
msec	millisecond
NA	not applicable
NARTE	National Association of Radio and Telecommunications Engineers, Inc.
PIR	passive infra-red
QP	quasi-peak (detector)
RBW	resolution bandwidth
RF	radio frequency
RE	radiated emission
V	volt
W	watt

1.2 Specification references

CFR 47 part 15: October 1998	Radio Frequency Devices.
ANSI C63.2:06/1987	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4:1992	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

1.3 EUT description

The EUT is a microprocessor controlled, wireless PIR motion detector that incorporates an on-board miniature transmitter operating at 315 MHz frequency, AM, on/off keying. Two detector models LEGACY and K980W are identical except of the optical lens.
Following detection, the EUT activates the transmitter for 2 seconds, then disarms itself to save battery power. The detector rearms itself (reverts to the ready state) automatically 2 minutes after the last movement has been detected. A TEST/NORMAL selector is used to override the 2-minute rearm timer during walk testing.
The EUT is supplied with built-in internal antenna and is powered by 9 V internal lithium or alkaline battery.

2 Test facility description

2.1 General

Tests were performed at Hermon Laboratories, which is a fully independent, , private EMC, Safety and Telecommunication testing facility. Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), listed by Industry Canada for radiated measurements (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-809 for anechoic chamber, C-845 for conducted emissions site), assessed by NMi Certin B.V. (Netherlands) for a number of EMC, Telecommunications and Safety standards, and Accredited by AMTAC (UK) for safety of Medical Devices. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO GUIDE 25/EN 45001 for EMC, Telecommunications and Product Safety Information Technology Equipment (Certificate No. 839.01).

Address: PO Box 23, Binyamina 30550, Israel
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Person for contact: Mr. Alex Usoskin, testing and QA manager.

2.2 Equipment calibration

The test equipment has been calibrated according to its recommended procedures and is within the manufacturer's published limit of error. The standards and instruments used in the calibration system conform to the present requirements of MIL-STD-45662A.
The laboratory standards are calibrated by the third party (traceable to NIST, USA) on a regular basis according to equipment manufacturer requirements.

2.2.1 Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Conducted emissions with LISN	9 kHz to 30 MHz: ± 2.1 dB
Radiated emissions in the open field test site at 10 m measuring distance	Biconilog antenna: ±3.2 dB Log periodic antenna: ±3 dB Biconical antenna: ±4 dB
Radiated emissions in the anechoic chamber at 3 m measuring distance	Biconilog antenna: ±3.2 dB Double ridged guide antenna: ±2.36 dB

2.3 Laboratory personnel

The three people of Hermon Laboratories that have participated in measurements and documentation preparation are: Dr. Edward Usoskin - C.E.O., Mrs. Eleonora Pitt, test engineer and Mrs. Marina Cherniavsky - certification engineer.
Dr. E. Usoskin is an EMC specialist, E. Pitt is an EMC accredited test laboratory engineer and M. Cherniavsky is a telecommunication engineer certified by the National Association of Radio and Telecommunications Engineers (NARTE, USA.).
The Hermon Laboratories' personnel that participated in this project have more than 100 years combined experience time in EMC measurements and electronic products design.

2.4 Statement of qualification

The test measurement data supplied in this test measurement report having been received by me, is hereby duly certified. The following is a statement of my qualifications:
I am an engineer, graduated from university in 1974 with an MScEE degree and certified by NARTE as an EMC accredited test laboratory engineer, the certificate no. is ATL–0006–E.
I have obtained 26 years experience in EMC measurements and have been with Hermon Laboratories since 1991.

Name: Mrs. Eleonora Pitt Signature: _____
Position: test engineer Date: September 6, 1999

I hereby certify that this test measurement report was prepared by me and is hereby duly certified. The following is a statement of my qualifications.
I am an engineer, graduated from university in 1971, with an MScEE degree, have obtained 26years experience in electronic products design and development, have been with Hermon Laboratories since 1991. Also, I am a telecommunication class II engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA.), the certificate no. is E2-03410.

Name: Mrs. Marina Cherniavsky Signature: _____
Position: certif. engineer Date: September 6, 1999

I hereby certify that this test measurement report was prepared under my direction and that to the best of my knowledge and belief, the facts set in the report and accompanying technical data are true and correct.
The following is a statement of my qualifications.
I have a Ph.D. degree in electronics, have obtained more than 42 years of experience in EMC measurements and electronic product design and have been with Hermon Laboratories since 1986.
. Also, I am an EMC engineer certified by the National Association of Radio and Telecommunications Engineers, Inc. (USA). The certificate no. is EMC-000623-NE, Senior Member.

Name: Dr. Edward Usoskin Signature: _____
Position: C.E.O. Date: September 6, 1999

3 Radiated emission measurements

3.1 Field strength of emissions according to § 15.231 (b)

3.1.1 Specified limits at 3 m distance

Fundamental frequency MHz	Field strength of fundamental dB (μV/m)	Field strength of spurious emissions dB (μV/m)
315	75.6	55.6

3.1.2 Test procedure and results

The test was performed in the anechoic chamber at 3 meters test distance, i.e. the distance between measuring antenna and EUT boundary. The EUT was placed on the wooden turntable, as shown in Figure 3.1 and operated in continuous transmitting mode. All the transmitter modes of operation were tested. The frequency range from 30 MHz up to 10th harmonic was investigated.
Biconilog and double ridged guide antennas were used. To find maximum radiation the turntable was rotated 360^{o}, measuring antenna height was changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.
The peak detector with RBW = 120 kHz at frequencies below 1 GHz and RBW = VBW = 1 MHz above 1 GHz was used in course of measurements.
The EUT has met the average emission requirements. The peak emission limitation of §15.35 were also met.
The test results are recorded into Table 3.1. Average factor is equal to

$$20 \log \{(T_{on} \text{ x duty cycle})/100\} = 20 \log \{(50 \text{ x } 0.5)/100\} = -12 \text{ dB, where}$$

1) T_{on} = 50 msec, pulse train duration within 100 msec is 50 msec, as shown in Plots 3.1.1 to 3.1.2
2) duty cycle is 0.5, as shown in Plots 3.1.3 to 3.1.4.

Reference numbers of test equipment used

HL 0041	HL 0275	HL 0465	HL 0521	HL 0593	HL 0594	HL 0604
HL 0815	HL 0816					

Full description is given in Appendix A.

Table 3.1

Radiated emission measurements - test results
(Field strength of fundamental frequency and spurious)

TEST SPECIFICATION: FCC part 15 subpart C § 15.231
DATE: June 27, 1999
RELATIVE HUMIDITY: 51%
AMBIENT TEMPERATURE: 24°C

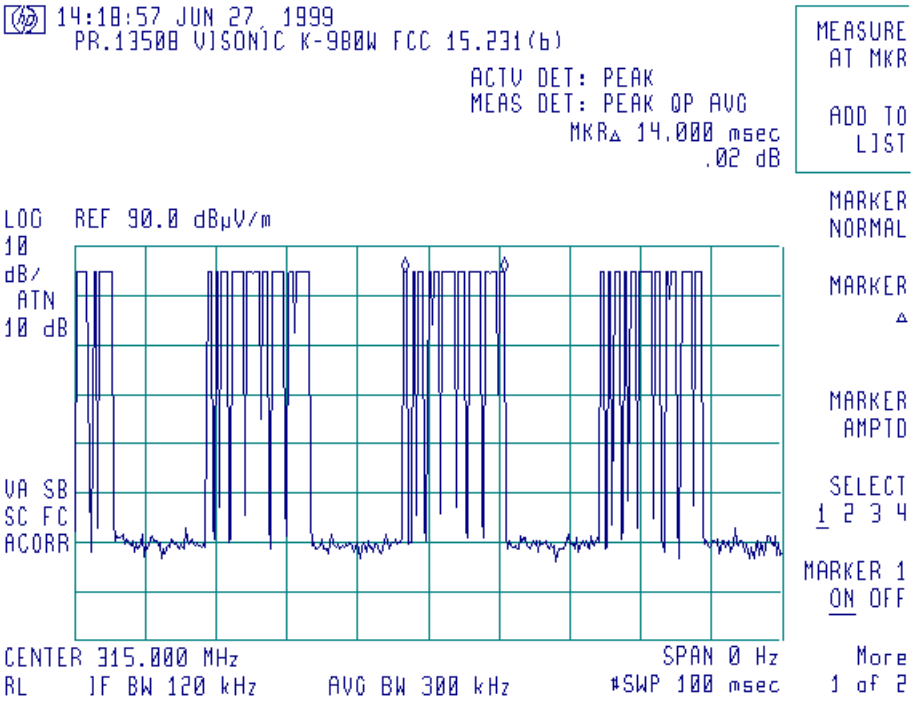
MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

Frequency MHz	Measured result, peak dB (µV/m)	RWB MHz	Calculated radiated emission, average dB (µV/m)	Peak limit dB (µV/m)	Peak limit margin dB	Average limit dB (µV/m)	Average limit margin dB	Pass/ Fail
315.000	84.95	0.120	72.95	95.6	10.65	75.6	2.65	Pass
630.030	39.5	0.120	27.5	75.6	36.1	55.6	28.1	Pass
945.000	48.9	0.120	36.9	75.6	26.7	55.6	18.7	Pass
1260.00	46.5	1	34.5	75.6	29.1	55.6	21.1	Pass
1575.00	46.5	1	34.5	75.6	29.1	55.6	21.1	Pass
1890.00	56.7	1	44.7	75.6	18.9	55.6	10.9	Pass

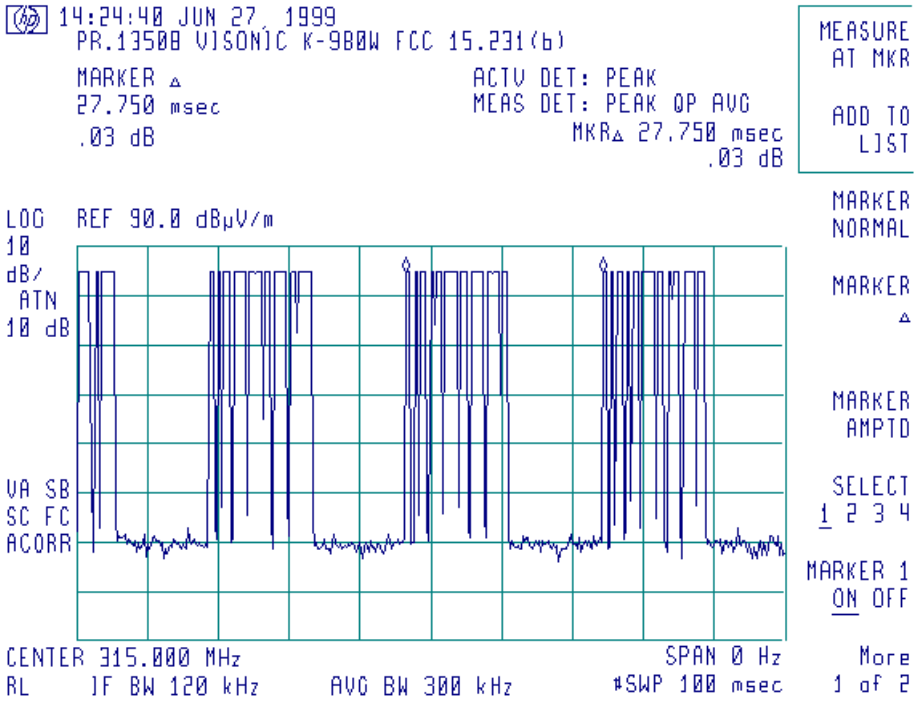
Notes to table:

Peak detector was used.
Calculated radiated emission dB(µV/m) = peak measured result dB(µV/m) + average factor (dB).
Average factor = -12 dB
Average limit is in accordance with § 15.231(b), peak limit = average limit dB(µV/m) +20 dB
Average limit margin = average limit dB(µV/m) – calculated radiated emission dB(µV/m).
Peak limit margin = peak limit dB(µV/m) – peak measured result dB(µV/m).

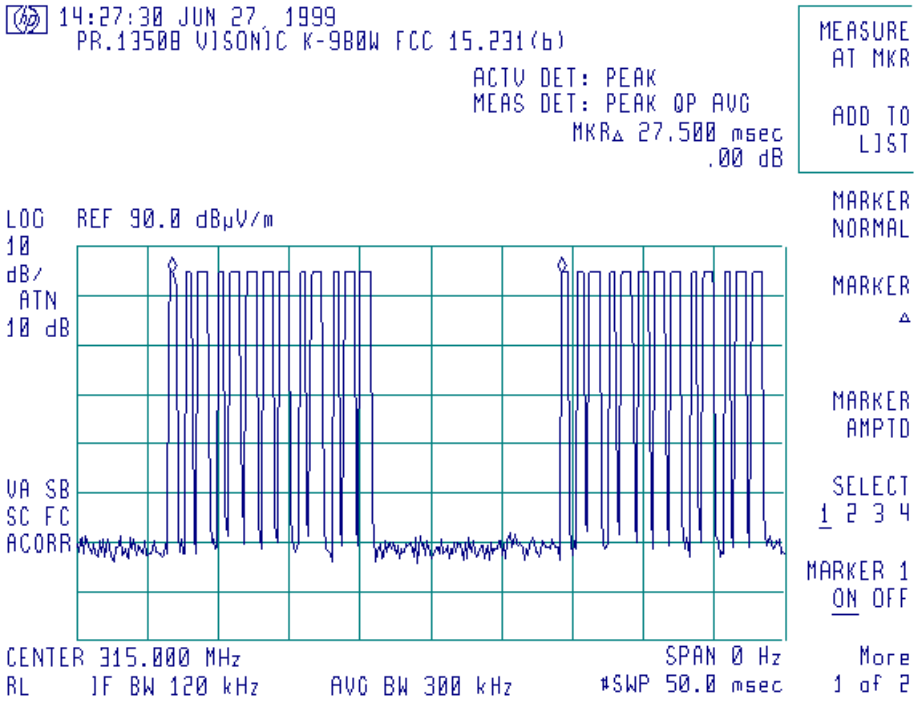
Plot 3.1.1
Pulse duration measurement results



Plot 3.1.2
Pulse duration measurement results



Plot 3.1.3
Pulse duration measurement results



Plot 3.1.4
Duty cycle measurement results

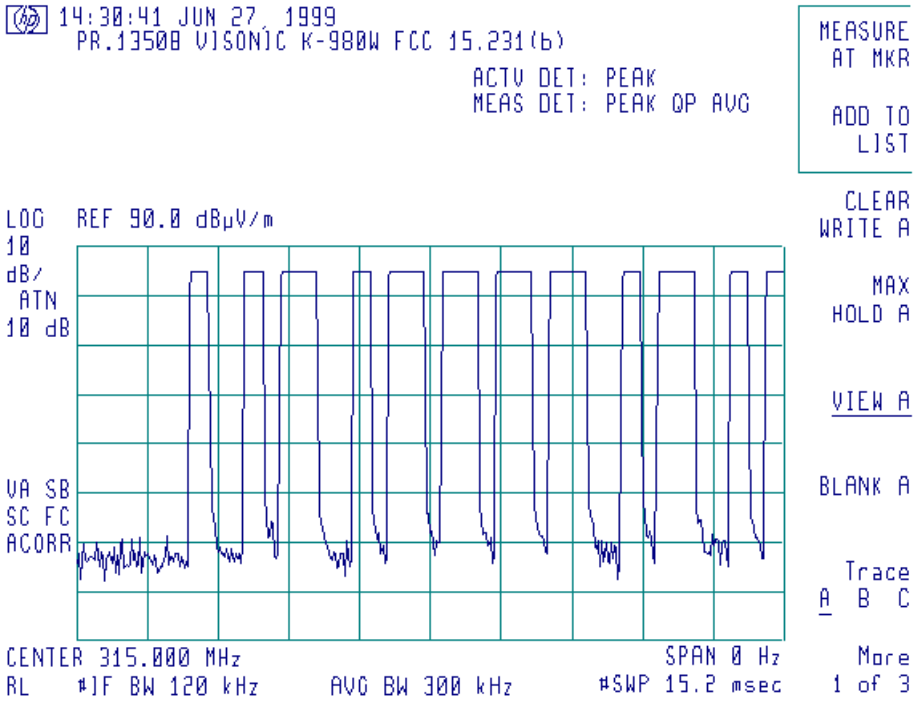
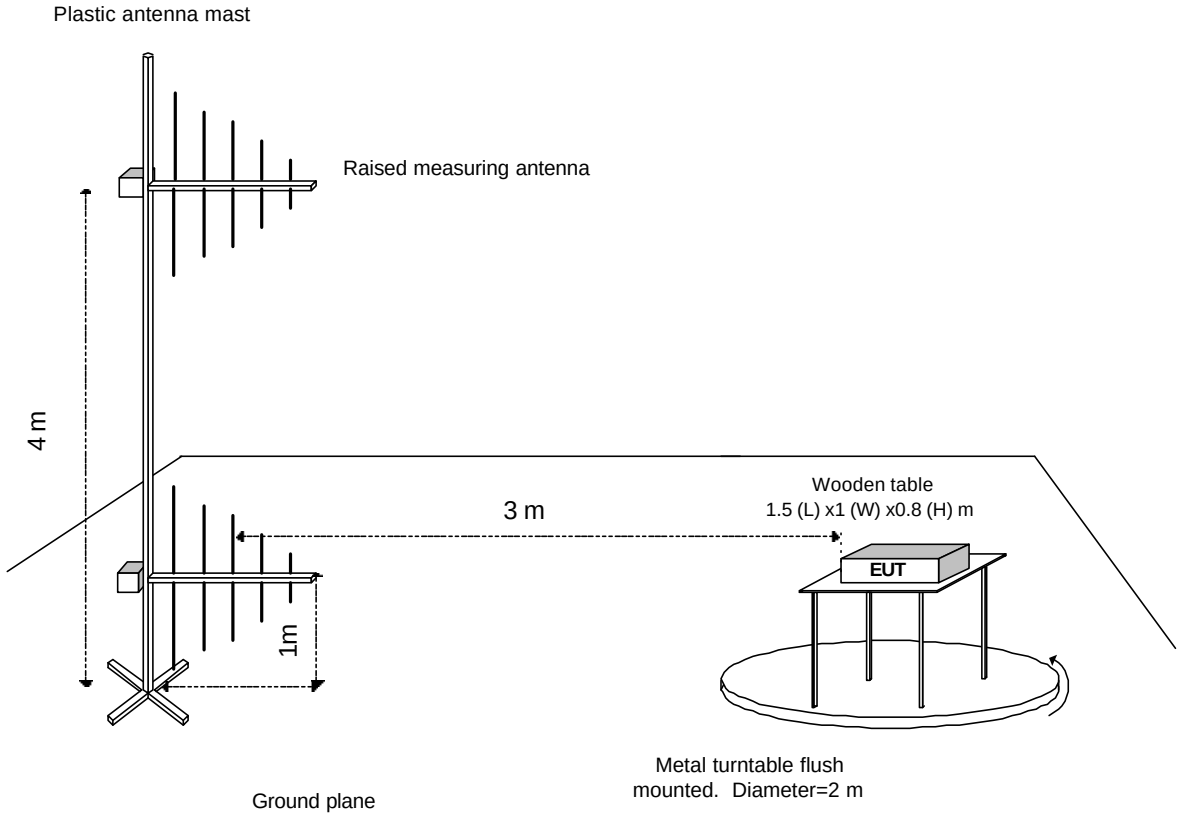


Figure 3.1
Radiated emission test setup



3.2 Bandwidth of emission according to § 15.231 (c)

3.2.1 Specified limits

The bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

3.2.2 Test procedure and results

The maximum allowed occupied bandwidth was calculated as 0.0025 of the center frequency:

0.0025 x 315 MHz = 787.5 kHz

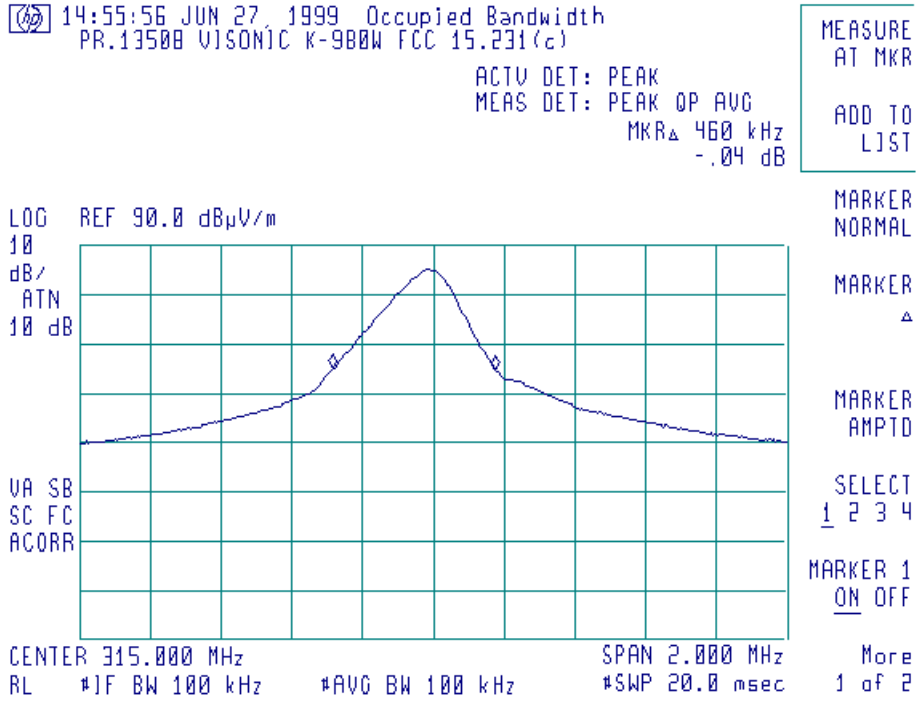
The spectrum trace data around transmitter fundamental frequency was obtained with the spectrum analyzer in “Max Hold” mode. The bandwidth value was determined between two points 20 dB down from the modulated carrier. The occupied bandwidth of 460 kHz was measured which is narrower than required 787.5 kHz.
The test results are shown in Plot 3.2.1.

Reference numbers of test equipment used

HL 0275	HL 0465	HL 0521	HL 0593	HL 0594	HL 0604	HL 0815
HL 0816						

Full description is given in Appendix A.

Plot 3.2.1
Emission bandwidth measurement results
Occupied bandwidth = 460 kHz



3.3 Periodic operation requirement §15.231(a)(2)

Following detection, the EUT activates the transmitter for 2 seconds, then disarms itself to save battery power. The detector rearms itself (reverts to the ready state) automatically 2 minutes after the last movement has been detected.

The software of the controller will stop transmission in any case after 2 seconds maximum.

3.4 Unintentional radiated emissions test according to §15.109

3.4.1 Definition of the test

This test was performed to measure radiated emissions from the incorporated digital device of the EUT and also to verify the EUT full compliance with §15.109.

3.4.2 The test set-up configuration

The radiated emissions measurements of the EUT incorporated digital device were performed in the anechoic chamber at 3 meters measuring distance in the frequency range from 30 MHz to 2 GHz. The EUT was placed on the wooden table as shown in Figure 3.1. The biconilog antenna was used. To find maximum radiation the turntable was rotated 360^{o}, the measuring antenna height changed from 1 to 4 m, and the antennas polarization was changed from vertical to horizontal.
The measurements were performed with the EMI receiver settings:
from 30 MHz to 1 GHz RBW=120 kHz, peak detector;
from 1 GHz up to 2 GHz RBW = VBW = 1 MHz, peak detector.
The results of measurements are shown in Plots 3.4.1, 3.4.2. All the found emissions were at least 15 dB below specified limit.

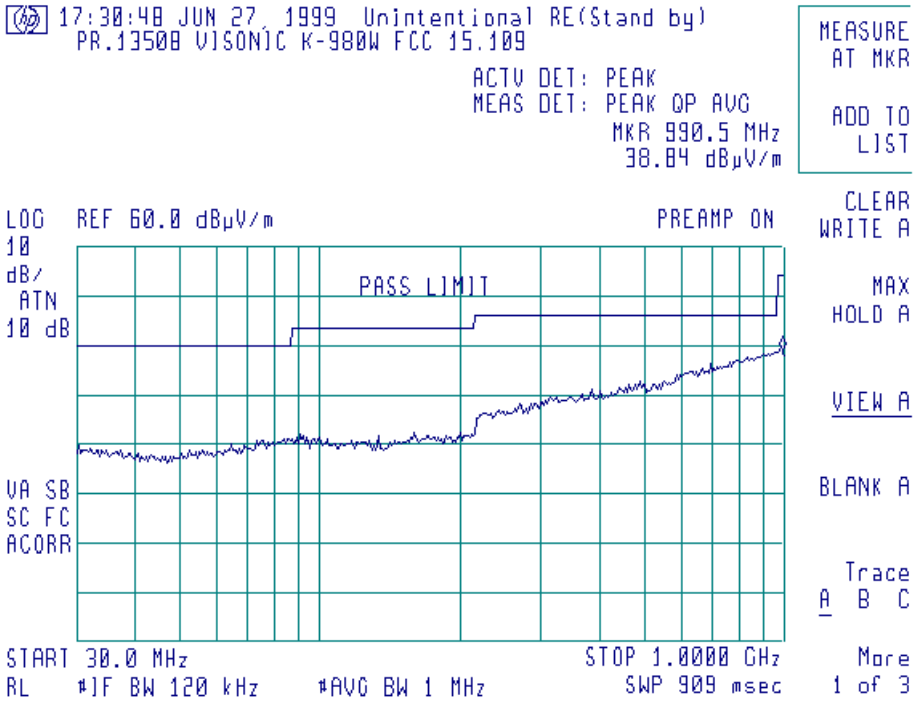
Reference numbers of test equipment used

HL 0275	HL 0465	HL 0521	HL 0593	HL 0594	HL 0604	HL 0815
HL 0816						

Full description is given in Appendix A.

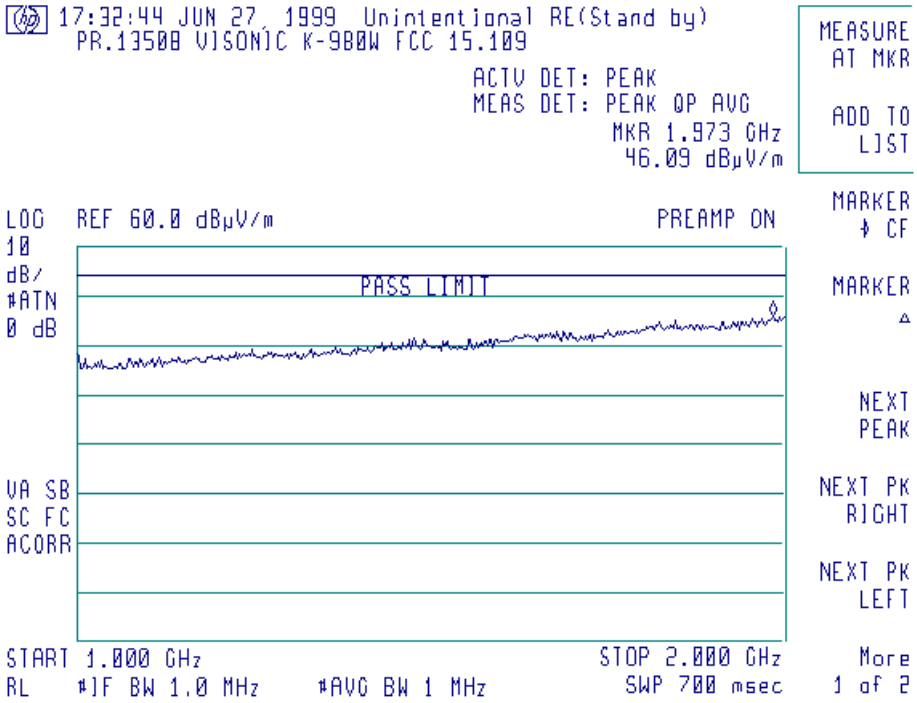
Plot 3.4.1

Test specification: §15.109, §15.209
Radiated emissions of digital incorporated device



Plot 3.4.2

Test specification: §15.109, §15.209
Radiated emissions of digital incorporated device



4 Summary and signatures

The transmitter, FCC ID:GSAK980W, was found to be in compliance with the requirements of FCC part 15 subpart C §§ 15.231, 15.209 and subpart B §15.109.

Test performed by:

Mrs. Eleonora Pitt, test engineer _____

Approved by:

Dr. Edward Usoskin, C.E.O. _____

Responsible person from Visonic Ltd.

Mr. Arick Elshtein, technical support manager _____

APPENDIX A - Test equipment and ancillaries used for tests

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0041	2811	Double Ridged Guide Antenna, 1-18 GHz	Electro-Metrics	RGA 50/60	8/00
0275	040	Table non-metallic, 1.5 x 1.0 x 0.8 m	Hermon Labs	WT-1	3/00 check
0465	023	Anechoic Chamber 9 (L) x 6.5 (W) x 5.5 (H) m	Hermon Labs	AC-1	10/99
0521	0319	Spectrum Analyzer with RF filter section (EMI Receiver 9 kHz – 6.5 GHz)	Hewlett Packard	8546A	7/00
0593	101	Antenna Mast, 1-4 m/ 1-6 m, pneumatic	Hermon Labs	AM-F1	4/00 check
0594	102	Turntable for Anechoic Chamber, flush mounted, d=1.2 m, pneumatic	Hermon Labs	WDC1	11/99 check
0604	1011	Antenna Log-Periodic/T Bow-Tie, 26 – 2000 MHz	EMCO	3141	12/99
0815	151	Cable, coax, RG-214, 7.3 m, N-type connectors, inside anechoic chamber	Hermon Labs	C214-7	8/00
0816	152	Cable, coax, RG-214, 8 m, N-type connectors, outside anechoic chamber	Hermon Labs	C214-8	8/00

APPENDIX B-Test equipment correction factors

Antenna factor at 3m calibration
Biconilog antenna EMCO, model 3141, Ser.No.1011

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

Antenna factor is to be added to receiver meter reading in dB(μV) to convert to field intensity in dB(μV/meter).

Antenna factor
Double ridged guide antenna
Electro-Metrics, model RGA-50/60
Ser.No.2811

Frequency, MHz	Antenna factor, dB(1/m)
1000	24.3
1500	25.4
2000	28.4
2500	29.2
3000	30.5
3500	31.6
4000	33.7
4500	32.2
5000	34.5
5500	34.5
6000	34.6
6500	35.3
7000	35.5
7500	35.9
8000	36.6
8500	37.3
9000	37.7
9500	37.7
10,000	38.2
10,500	38.5
11,000	39.0
11,500	40.1
12,000	40.2
12,500	39.3
13,000	39.9
13,500	40.6
14,000	41.1
14,500	40.5
15,000	39.9
15,500	37.8
16,000	39.1
16,500	41.1
17,000	41.7
17,500	45.1
18,000	44.3

Antenna factor dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/meter)