ELECTROMAGNETIC EMISSIONS TEST REPORT

ACCORDING TO FCC PART 15, SUBPART C, §15.209

FOR

VISACCESS Ltd.

EQUIPMENT UNDER TEST

SINGLE DOOR ACCESS CONTROL SYSTEM model VXS-10

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

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

Approved by: ________________
Mr. Arick Elshtein, technical support manager
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ACCREDITED 839.01
Electrical

Description of equipment under test

Test items	Access control system, FCC ID:GSAVXS10
Manufacturer	Visaccess Ltd.
Brand Mark	Visaccess Ltd.
Type (Model)	VXS-10

Applicant information

Applicant's representative & responsible person	Mr. Arick Elshtein, technical support manager
Company	Visaccess 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 6743

Test performance

Project Number	13644
Location of the test	Hermon Laboratories, Binyamina, Israel
Test started	September 21, 1999
Test completed	September 21, 1999
Purpose of test	The EUT certification in accordance with CFR 47, part 2, §2.1033
Test specification(s)	FCC part 15, subpart C, §15.209, §15.207 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 period 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:

AC	alternating current
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
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.
Ω	Ohm
QP	quasi-peak (detector)
RBW	resolution bandwidth
RF	radio frequency
RE	radiated emission
RMS	root-mean-square
sec	second
V	volt

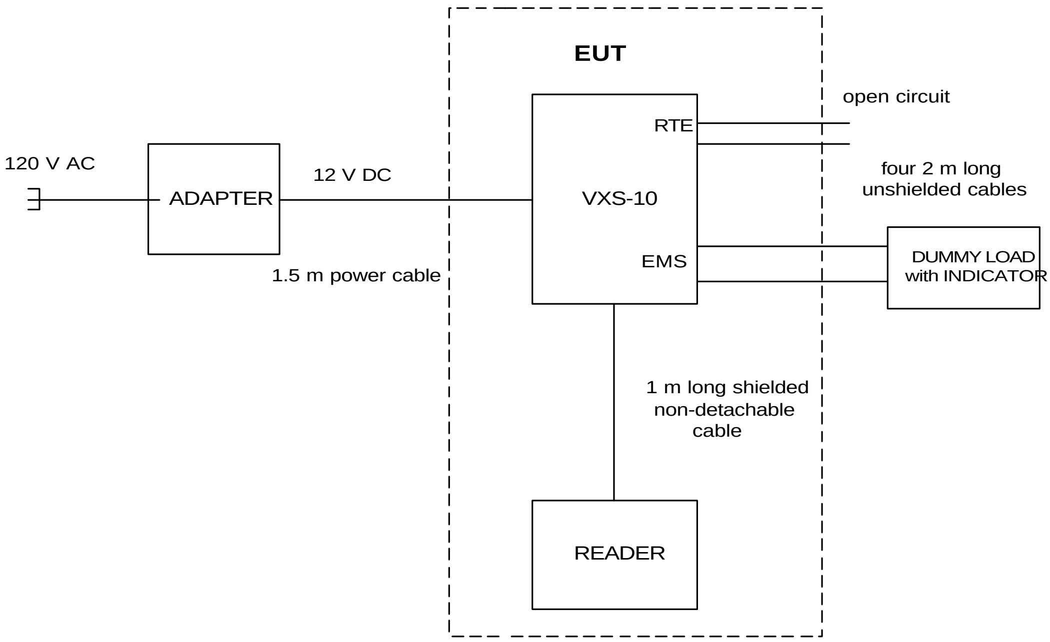
1.2 Specification references

CFR 47 part 15: October 1998	Radio Frequency Devices.
ANSI C63.2:06/1996	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, VXS-10, is an electronic access control system for a single access point. The EUT controller relay activates a lock or electromagnetic strike, when a valid proximity key (tag) is presented to the reader, located outside the protected area. The reader contains a transmitter operating at 125 kHz±2% frequency. A permanently attached loop antenna is disposed on the perimeter of the printed circuit board. The EUT is powered from the mains via 120 V AC/12 V DC adapter.
Throughout the testing the VXS-10 “electromagnetic strike” (EMS) terminal was connected to a dummy load and the “request-to-exit” (RTE) cables were not terminated. The EUT test configuration is given in Figure 1.1.

Figure 1.1
EUT test configuration



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) and 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, Safety standards, and assessed 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
Telephone: +972 6628 8001
Fax: +9726 628 8277

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 Radiated emissions in the anechoic chamber at 3 m measuring distance	Biconilog antenna: ±3.2 dB Log periodic antenna: ±3 dB Biconical antenna: ±4 dB 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., Mr. Michael Feldman, test technician and Mrs. Marina Cherniavsky - certification engineer.
Dr. E. Usoskin is an EMC specialist, M. Feldman is an EMC accredited test laboratory technician 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 90 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 a technician, have obtained 30 years experience in electronics and measurements. I am certified by NARTE as an EMC accredited test laboratory technician, the certificate no. is ATL–0009–T and have been with Hermon Laboratories since 1995.

Name: Mr. Michael Feldman Signature: ________________
Position: test technician Date: November 10, 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 26 years experience in electronic products design and development and 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: November 10, 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: November 10, 1999

3 Radiated emission measurements

3.1 Field strength of emissions according to § 15.209 (a)

3.1.1 Specified limit

Frequency, MHz	Field strength, microvolts/meter	Field strength, dB(μV/m)	Measurement distance, meters
0.125	19	25.6	300

3.1.2 Extrapolation (distance correction) factor

The test was performed in the Hermon Labs anechoic chamber at 3 meter test distance, i.e. the distance between measuring antenna and EUT boundary. The square of an inverse linear distance factor 40 dB/decade was used to extrapolate test results to the specified distance.

$$DF = 40 \log (D_1/D_2) = 40 \log (300/3) = 80 \text{ dB, where}$$

D_1 is the 300 meters specified measurement distance

D_2 is the 3 meters test measurement distance.

The DF=80 dB was applied for limit calculation at 3 m test distance measurements.

For 125 kHz frequency the calculated limit is:

$Limit_{3m} = Limit_{300\,m} + DF = 25.6$ dB(μV/m) + 80 dB = 105.6 dB(μV/m).

3.1.3 Test procedure

The EUT was placed on the wooden turntable, as shown in Figure 3.1.1, Photographs 3.1.1, 3.1.2 in configuration shown in Figure 1.1 and operated in continuous modulated transmitting mode. During testing the EUT was positioned in three orthogonal axes and the measurements were performed with loop antenna. The center of the loop antenna was positioned 1 m above the ground. The frequency range from 9 kHz up to 10th harmonic was investigated.

To find maximum radiation the turntable was rotated 360^{o}, the antenna was rotated about its vertical axis and the antenna polarization was changed from vertical to horizontal.

The average detector was used. The test measurement results were recorded into Table 3.1.1 and are shown in Plots 3.1.1, 3.1.2.

Reference numbers of test equipment used

HL 0275	HL 0446	HL 0465	HL 0521	HL 0593	HL 0594	HL 0815
HL 0816						

Full description is given in Appendix A.

Table 3.1.1

Radiated emission measurements
(Field strength of fundamental frequency)

TEST SPECIFICATION: FCC part 15 subpart C § 15.209
DATE: September 21, 1999
RELATIVE HUMIDITY: 56%
AMBIENT TEMPERATURE: 23°C

MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

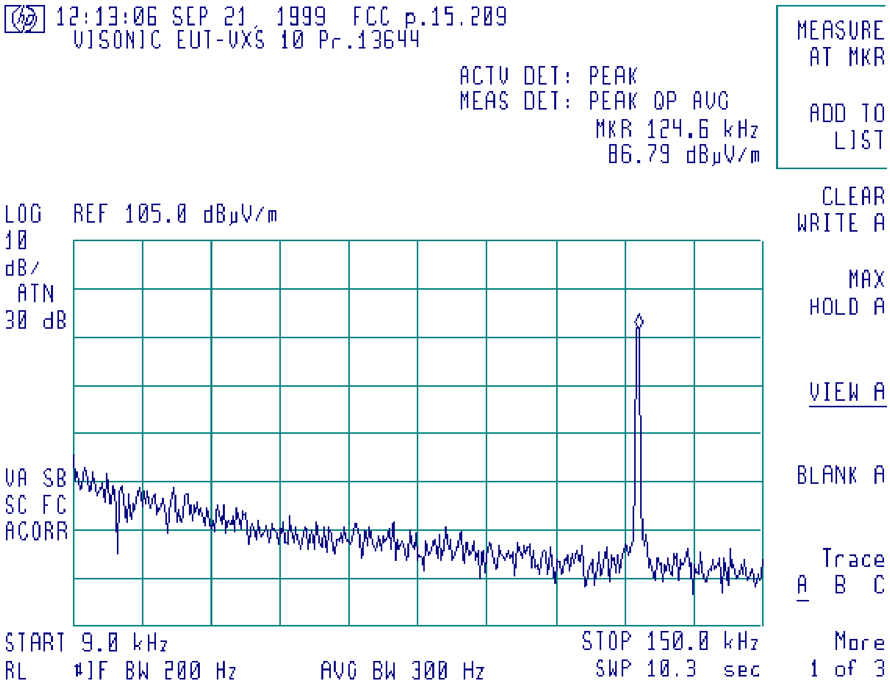
Frequency kHz	Resolution bandwidth kHz	Measured result dB (µV)	Calculated limit dB (µV/m)	Margin dB	Pass/ Fail
123.6	0.2	86.8	105.6	18.8	Pass

Notes to table:

Loop antenna and the average detector were used.
Calculated limit is in accordance with section 3.1.2 of this test report.

Plot 3.1.1

Test specification: §15.209
Field strength of fundamental frequency



Plot 3.1.2

Test specification: §15.209
Radiated emissions test results

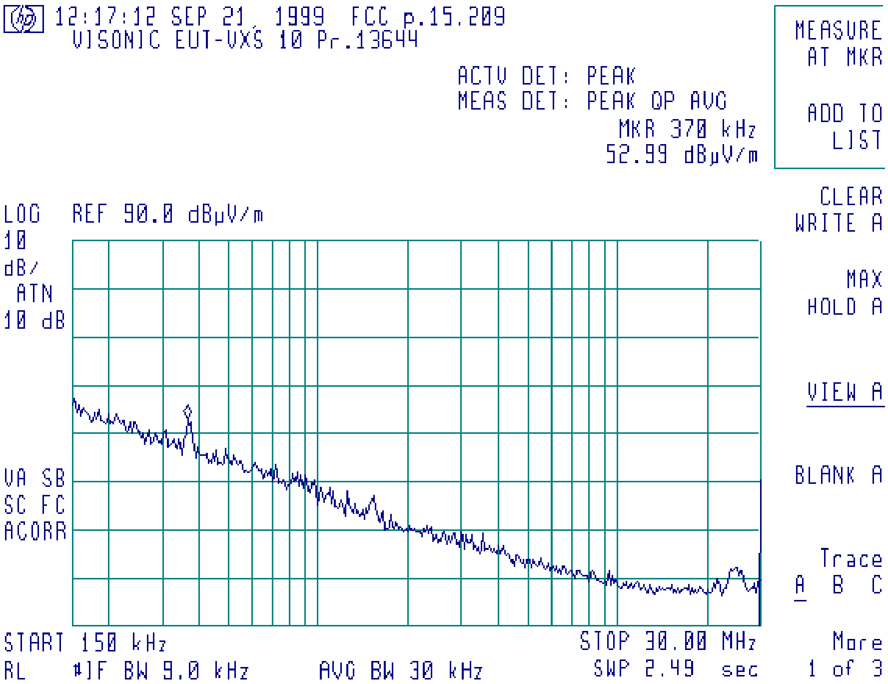
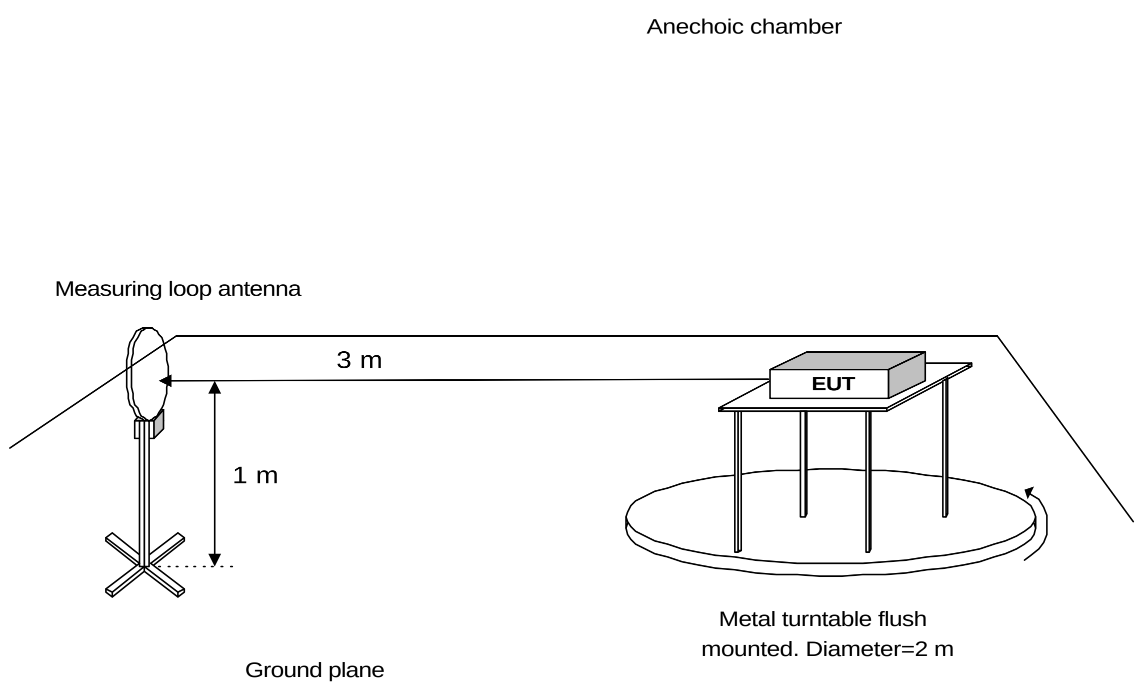
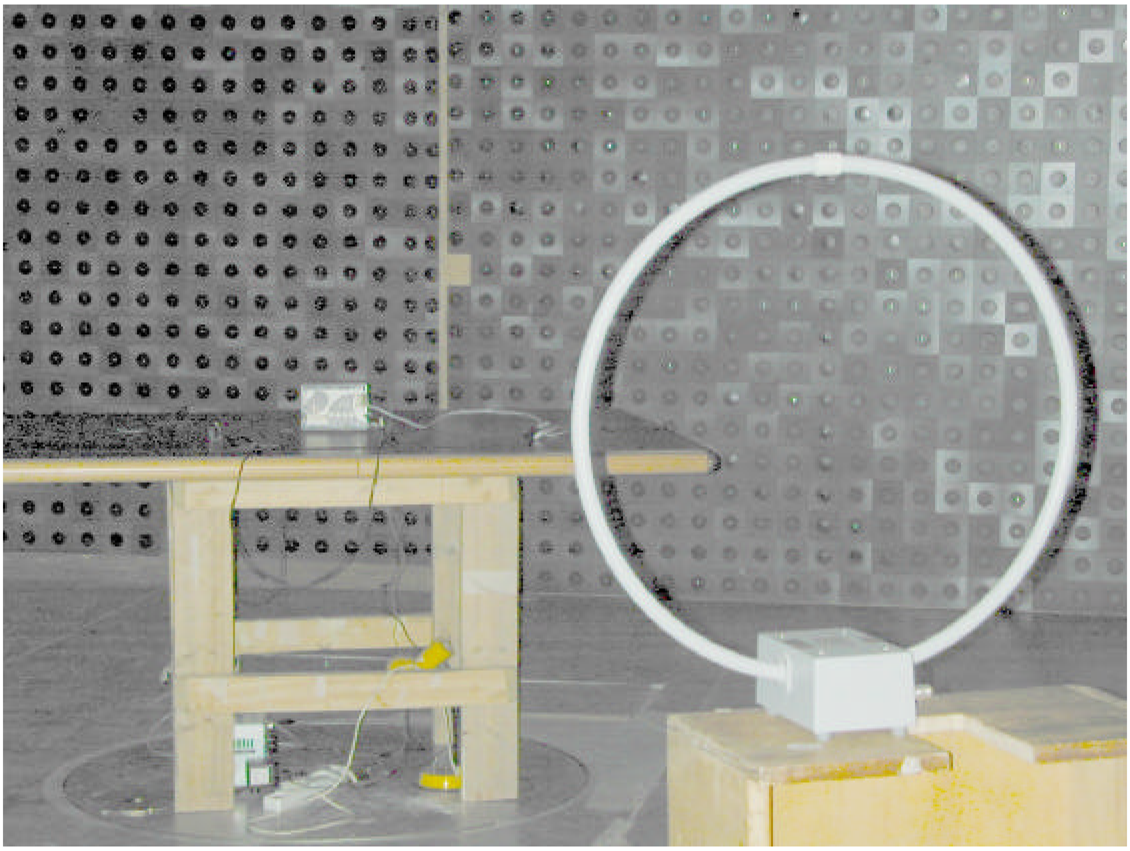


Figure 3.1.1
Radiated emission test setup



Photograph 3.1.1
Radiated emission measurements setup



Photograph 3.1.2
Radiated emission measurements setup

3.2 Unintentional radiated emissions test according to §15.109

3.2.1 General

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.

3.2.2 Test procedure

The radiated emissions measurements of the EUT incorporated digital device were performed in the anechoic chamber at 3 meter measuring distance in the frequency range from 30 MHz to 1 GHz. The EUT was placed on the wooden table as shown in Figure 3.2.1 and Photographs 3.2.1, 3.2.2. The biconilog antenna was used. To find maximum radiation the turntable was rotated 360°, the measuring antenna height changed from 1 to 4 m, and the antenna polarization was changed from vertical to horizontal.
The measurements were performed with the EMI receiver settings: RBW=120 kHz, peak and quasi peak detectors.
The test measurement results are given in Table 3.2.1 and 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.

Table 3.2.1 Radiated emission measurements test results frequency range 30 MHz – 1 GHz

TEST SPECIFICATION: FCC part 15 subpart B §15.109
DATE: September 21, 1999
RELATIVE HUMIDITY: 56%
AMBIENT TEMPERATURE: 23°C

MEASUREMENTS PERFORMED AT 3 METRES DISTANCE

Frequency MHz	Radiated emissions dB (µV/m)	Limit dB (µV/m)	Margin dB	Pass/ Fail
30.390	25.32	40.0	14.68	Pass
38.427	33.45	40.0	6.55	Pass
77.539	21.19	40.0	18.81	Pass

Notes to table calculations:

Measurements were performed with biconilog antenna and quasi-peak detector
Resolution bandwidth = 120 kHz
Margin = dB below (negative if above) specification limit.

Plot 3.2.1

Test specification: §15.109
Radiated emissions of digital incorporated device

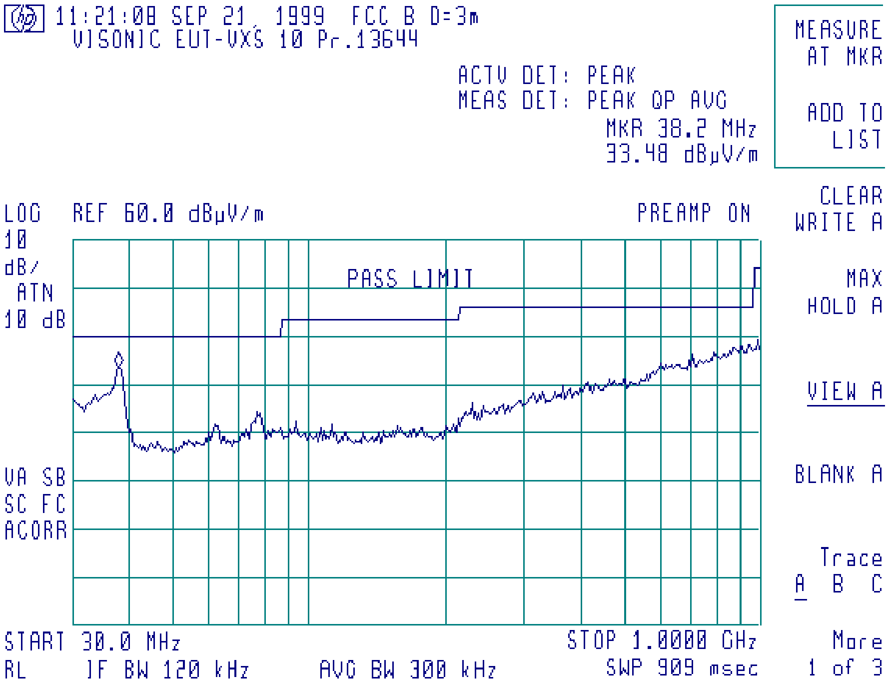
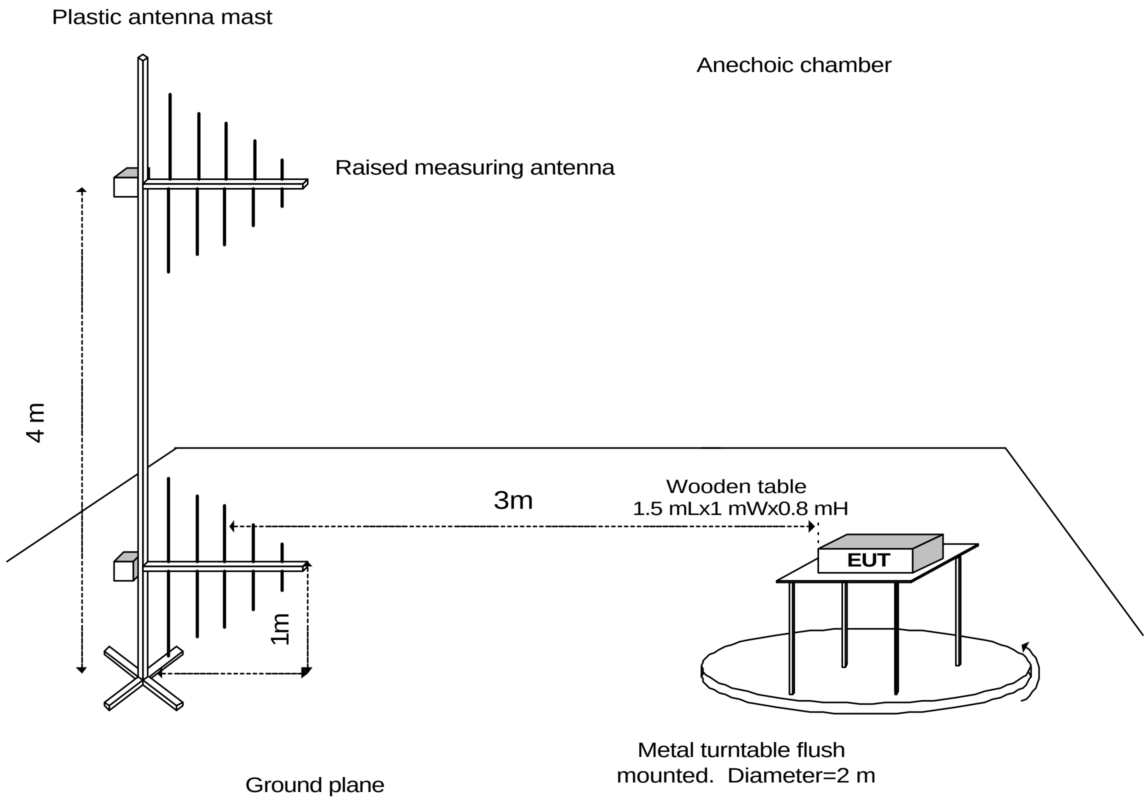
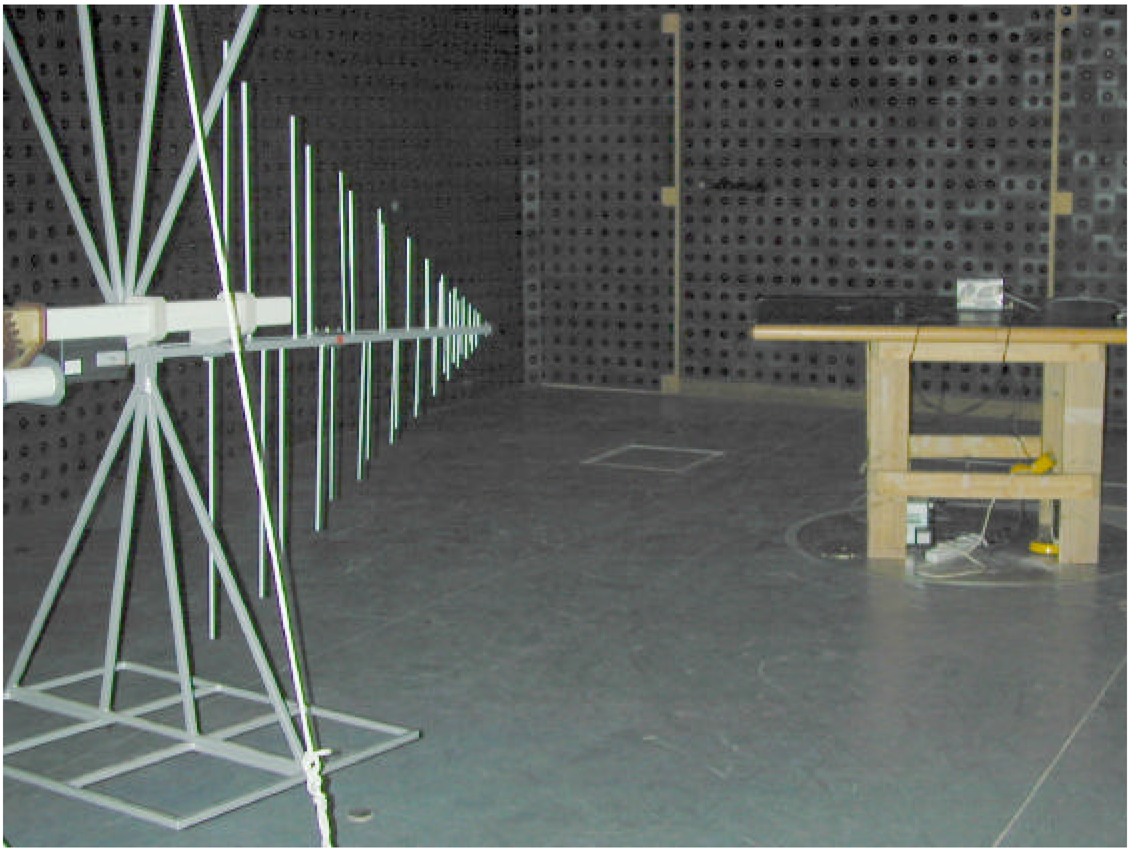


Figure 3.2.1

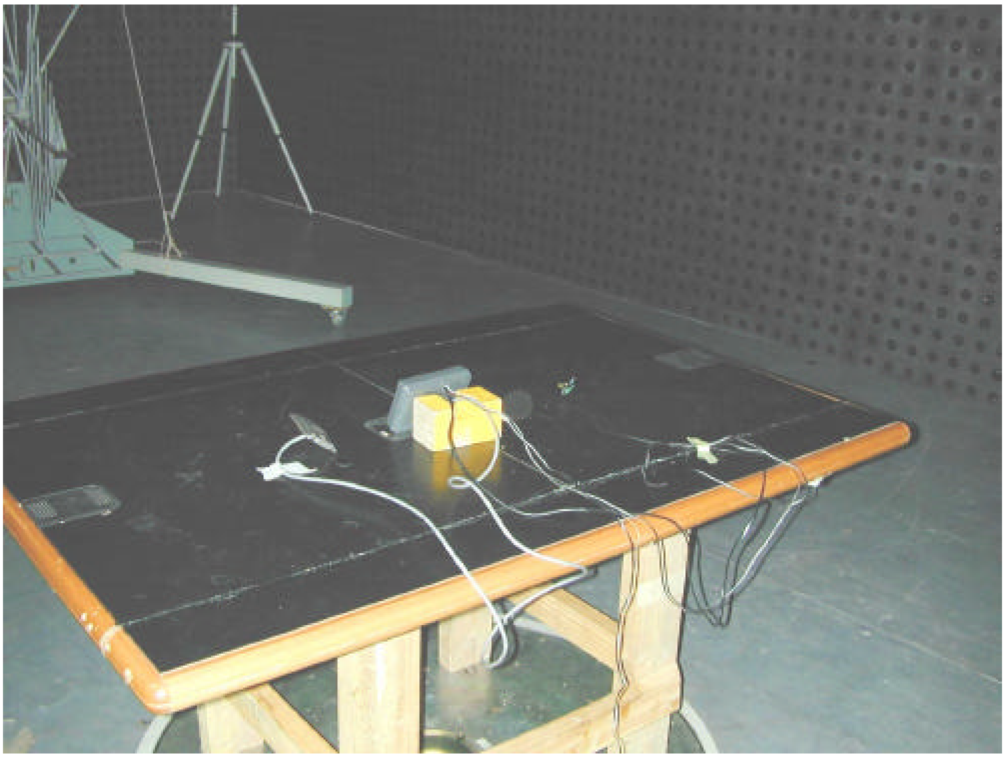
Radiated emission test setup



Photograph 3.2.1
Radiated emission measurements setup



Photograph 3.2.2
Radiated emission measurements setup



3.3 Conducted emission measurements according to §15.107, §15.207

3.3.1 General

This test was performed to measure conducted emissions induced in mains by the EUT.

3.3.2 Test procedure

The test was performed in the shielded room. The EUT was set up on the wooden table as shown in Figure 3.3.1 and Photographs 3.3.1 to 3.3.2 in configuration, given in Figure 1.1. Frequency range from 450 kHz to 30 MHz was investigated.
The measurements were performed on the EUT 120 V AC power lines (both neutral and phase) by means of the LISN, connected to the spectrum analyzer. The unused coaxial connector of the LISN was terminated in 50 Ω. The position of the EUT cables was varied to determine maximum emission level. The peak and quasi peak detectors (resolution bandwidth = 9 kHz) were used. The test results are shown in Table 3.3.1 and Plots 3.3.1 to 3.3.2.

Reference numbers of test equipment used

HL 0447	HL0466	HL 0521	HL 0817			

Full description is given in Appendix A.

Table 3.3.1 Conducted emission measurements on EUT power lines
Frequency range : 450 kHz - 30 MHz

TEST SPECIFICATION: FCC part 15 subpart B §§15.107, 15.207
DATE: September 21, 1999
RELATIVE HUMIDITY: 54%
AMBIENT TEMPERATURE: 24°C

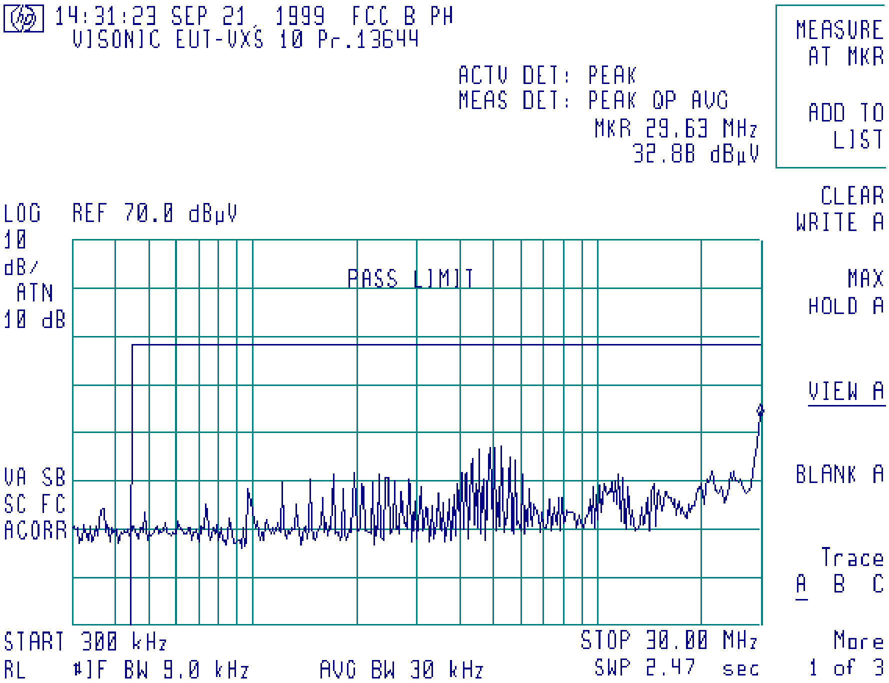
Frequency MHz	Line ID	Conducted emissions dB (μV)	Limit dB (μV)	Limit margin dB	Pass/ Fail
29.676	Ph/N	33.49	48	14.51	Pass

Test parameters:
Detector type = QP (quasi peak).
Resolution bandwidth = 9 kHz.

Table calculations and abbreviations:
Conducted emission = EMI meter reading (dBμV) + cable loss (dB) + LISN correction factor (dB).
For LISN correction factor refer to Appendix B.
Limit margin = dB below (negative if above) limit.
Line ID = Line identification (Ph - phase, N - neutral).

Plot 3.3.1

Test specification: § 15.107, § 15.207
Conducted emission measurements on power line
Frequency range: 450 kHz-30 MHz
Line: phase
Detector: peak



Plot 3.3.2

Test Specification: § 15.107, § 15.207
Conducted emission measurements on power line
Frequency range: 450 kHz-30 MHz
Line: neutral
Detector: peak

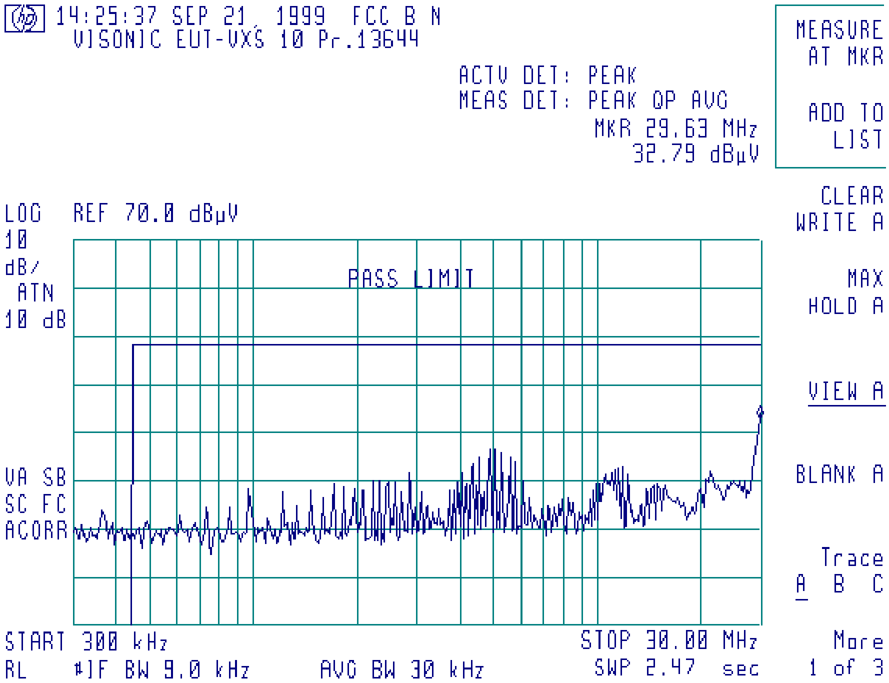
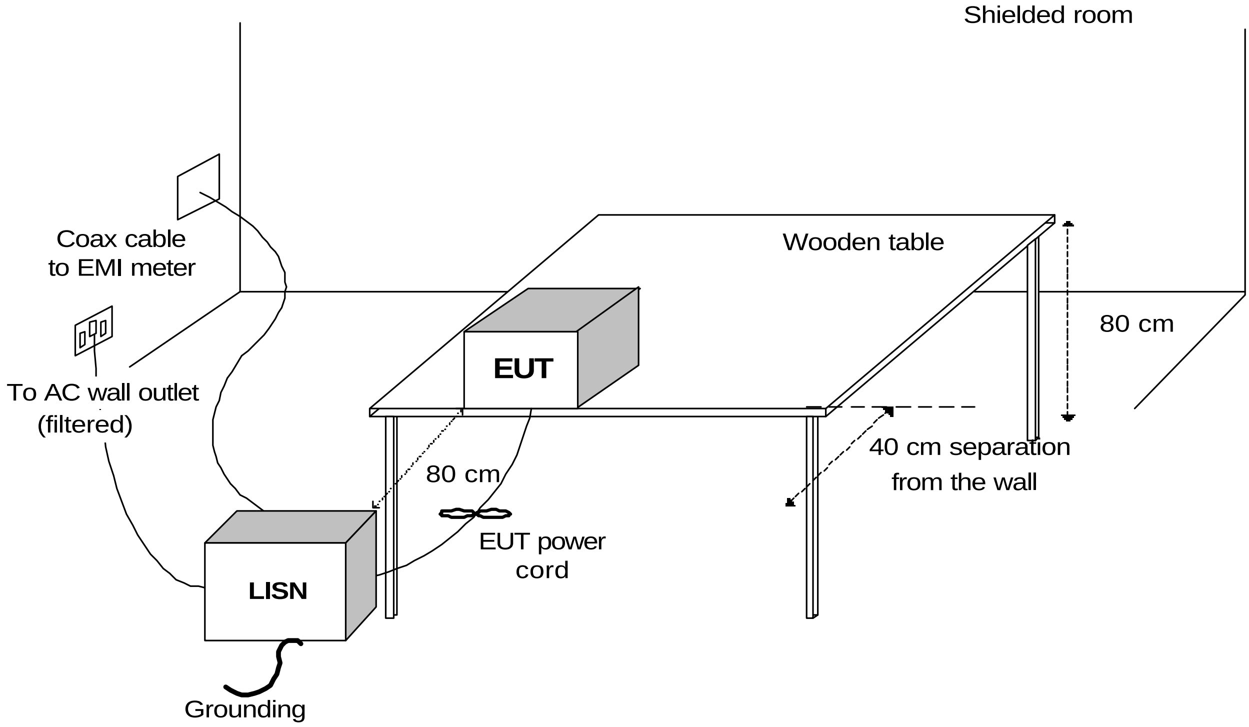


Figure 3.3.1
Conducted emissions test setup for table-top equipment



Photograph 3.3.1
Conducted emission measurement test setup

Photograph 3.3.2
Conducted emission measurement test setup

4. Summary and signatures

The EUT, VXS-10, was found to be in compliance with the FCC part 15 subpart C §§15.207, 15.209 and subpart B §§15.107, 15.109 class B limits.

Test performed by:

Mr. Michael Feldman, test technician

Approved by:

Dr. Edward Usoskin, C.E.O.

APPENDIX A – Test equipment and ancillaries used for tests

HL Serial No.	Serial No.	Description	Manufacturer	Model No.	Due Calibr.
0275	040	Table non-metallic, adjustable height, 1.5 x 1.0 x 0.8 m	Hermon Labs	TNM	3/00 Check
0446	2857	Antenna, Loop active, 10 kHz – 30 MHz	Electro-Mechanics	6502	10/00
0447	0447	LISN, 16/2, 300 V RMS	Hermon Labs	LISN 16-1	12/99
0465	023	Anechoic Chamber 9 (L) x 6.5 (W) x 5.5 (H) m	Hermon Labs	AC-1	3/00
0466	024	Shielded Room 3 (L) x 3 (W) x 2.4 (H) m	Hermon Labs	SR-1	5/02 Check
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	2/00
0594	102	Turntable for Anechoic Chamber, flush mounted, d=1.2 m, pneumatic	Hermon Labs	WDC1	11/00
0604	9611-1011	Antenna Biconilog Log-Periodic/T Bow-Tie, 26 - 2000 MHz	EMCO	3141	7/00
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
0817	153	Cable, coax, RG-58, 8 m, N-type connectors	Hermon Labs	C58-8	8/00

APPENDIX B-Test equipment correction factors

Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories

Frequency, kHz	Correction Factor
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70 80	0.18 0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor dB is to be added to the meter readings (dB/μv) of the interference analyzer or spectrum analyzer.

Antenna factor
Loop antenna,Electro-Mechanics, model 6502
Ser.No.2857

Frequency MHz	Antenna Factor dB(1/m)
0.009	18.7
0.010	17.7
0.020	13.2
0.050	10.4
0.075	10.2
0.100	9.9
0.150	9.8
0.250	9.9
0.500	9.8
0.750	9.7
1.000	10.1
2.000	10.0
3.000	10.2
4.000	10.1
5.000	10.1
10.000	9.6
15.000	9.6
20.000	9.3
25.000	8.7
30.000	7.5

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

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

Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8
28	7.8
30	7.8
40	7.2
60	7.1
70	8.5
80	9.4
90	9.8
100	9.7
110	9.3
120	8.8
130	8.7
140	9.2
150	9.8
160	10.2
170	10.4
180	10.4
190	10.3
200	10.6
220	11.6
240	12.4
260	12.8
280	13.7
300	14.7
320	15.2
340	15.4
360	16.1
380	16.4
400	16.6
420	16.7
440	17.0
460	17.7
480	18.1
500	18.5
520	19.1
540	19.5
560	19.8
580	20.6
600	21.3
620	21.5
640	21.2
660	21.4
680	21.9
700	22.2
720	22.2
740	22.1
760	22.3
780	22.6
800	22.7
820	22.9
840	23.1
860	23.4
880	23.8
900	24.1
920	24.1

Frequency, MHz	Antenna Factor, dB(1/m)
940	24.0
960	24.1
980	24.5
1000	24.9
1020	25.0
1040	25.2
1060	25.4
1080	25.6
1100	25.7
1120	26.0
1140	26.4
1160	27.0
1180	27.0
1200	26.7
1220	26.5
1240	26.5
1260	26.5
1280	26.6
1300	27.0
1320	27.8
1340	28.3
1360	28.2
1380	27.9
1400	27.9
1420	27.9
1440	27.8
1460	27.8
1480	28.0
1500	28.5
1520	28.9
1540	29.6
1560	29.8
1580	29.6
1600	29.5
1620	29.3
1640	29.2
1660	29.4
1680	29.6
1700	29.8
1720	30.3
1740	30.8
1760	31.1
1780	31.0
1800	30.9
1820	30.7
1840	30.6
1860	30.6
1880	30.6
1900	30.6
1920	30.7
1940	30.9
1960	31.2
1980	31.6
2000	32.0

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