TUV Rheinland of North America

FCCID TS9-DVS-R-100

Emissions & Immunity Test Report

EUT Name: Dosimetry Verification System (DVS) Reader

EUT Model: DVS-R-100

CFR Title 47 - Part 15, ANSI C64.3:2005

Prepared for:

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Report/Issue Date: 27 July 2006
Report Number: 30562169.003

Statement of Compliance

Manufacturer:	Sicel Technologies 3800 Gateway Centre Blvd., Ste. 308 Morrisville, NC 27560 919-465-2236
Requester / Applicant:	Brendan McSoley
Name of Equipment:	Dosimetry Verification System (DVS) Reader
Model No.	DVS-R-100
Type of Equipment:	Medical
Class of Equipment:	Intentional Radiator
Application of Regulations:	CFR Title 47 - Part 15, ANSI C64.3:2005
Test Dates:	24 October 2005 to 11 November 2005

Guidance Documents:

Emissions: FCC 47 CFR Part 15 - Subpart C

Test Methods:

Emissions: FCC §§15.209(a), 15.209(d), FCC §15.207(a), FCC §15.31(e), FCC §15.215(c),

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland of North America, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

Test Engineer	Date	NVLAP Signatory	Date
	27 July 2006		27 July 2006

NVLAP	FCC	Industry Canada
200094-0	90552 and 100881	IC3755

Table of Contents

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR Title 47 - Part 15, ANSI C64.3:2005 based on the results of testing performed on *24* October 2005 through *11* November 2005 on the *Dosimetry Verification System (DVS) Reader* Model No. *DVS-R-100* manufactured by Sicel Technologies. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Emission	Test Method(s)	Test Parameters	Result
Radiated Emissions	FCC §§15.209(a), 15.209(d)	9 kHz to 1000 MHz	**compliant**
Conducted Emissions	FCC §15.207(a)	150 kHz to 30 MHz	**compliant**
Frequency stability from power line variations	FCC §15.31(e)	85% - 115% nominal rated power line voltage	**compliant**
Signal bandwidth	FCC §15.215(c)	20dB Bandwidth of signal	**compliant**

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

No modifications were found to be necessary in order to achieve compliance.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America at the 762 Park Ave., Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland of North America is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Guide 17025:1999 and ISO 9002 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

2.1.4 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland of North America at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland of North America.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The test system for radiated immunity is defined as the antenna, amplifier, cables, signal generator field probe and spectrum analyzer. The test system for conducted immunity is defined as the coupling/decoupling device, amplifier, cables, signal generator and spectrum analyzer. The test system for voltage variations and interruptions immunity is defined as the AC power source and the interruptions generator. The test system for electrical fast transient immunity is defined as the AC power output source and the fast transient generator. The test system for lightning surge immunity is defined as the AC power output source and the lightning surge generator. The test system for electrostatic discharge immunity is defined as the air and contact discharge generators. The test system for power frequency magnetic field immunity is defined as the AC voltage source. The test system for the damped oscillatory wave immunity is defined as the AC power output source and the oscillatory wave generator. The test system for harmonic current and voltage flicker test is defined as the AC power source and the detection devices. The conducted emissions test system has a combined standard uncertainty of ± 1.2 dB. The radiated emissions test system has a combined standard uncertainty of ± 1.6 dB. The radiated immunity test system has a combined standard uncertainty of ± 2.7 dB. The conducted immunity test system has a combined standard uncertainty of ± 1.5 dB. The voltage variations and interruptions immunity test system has a combined standard uncertainty of ± 4.3 dB. The electrical fast transients immunity test system has a combined standard uncertainty of ± 5.8 dB. The lightning surge immunity test system has a combined standard uncertainty of ± 8.0 dB. The electrostatic discharge immunity test system has a combined standard uncertainty of ± 4.1 dB. The power frequency magnetic field immunity test system has a combined standard uncertainty of ± 0.58 dB. The damped oscillatory wave immunity test system has a combined standard uncertainty of ± 8.7 dB. The harmonic current and voltage flicker test system has a combined standard uncertainty of ± 11.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Guide 17025:1999.

3 Product Information

3.1 Product Description

The information for all equipment used in the tested system, including: descriptions of cables, clock and microprocessor frequencies, EMI critical components, and accessory equipment has been supplied by the manufacturer and is listed in the EMC Test Plan found in Section 6.

3.2 Equipment Configuration

A description and justification of the equipment configuration is given in the EMC Test Plan. The EUT was tested as described in the EMC Test Plan and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to warm up to normal operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Equipment Configuration given in the EMC Test Plan.

3.3 Operation Mode

A description and justification of the operation mode is given in the EMC Test Plan.

In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Operation Mode given in the EMC Test Plan.

4 Emissions

4.1 Radiated Emissions

Testing was performed in accordance with FCC §§15.209(a), 15.209(d). These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

4.1.1.3 Deviations

For frequencies from 9kHz to 30MHz; the specified limit is adjusted for the measurement distance used (40dB per decade) per FCC part 15.31(b)(2) and the limits are converted to dBµV/m.

All frequency field measurements from 9kHz to 1GHz are in dBµV/m.

For frequencies from 9kHz to 490kHz;
Limit = 20*log(2400/F(kHz)) + distance correction.

For frequencies from 490kHz to 1.705MHz;
Limit = 20*log (24000/F(kHz)) + distance correction.

For frequencies from 1.705MHz to 30MHz;
Limit = 20*log30 +distance correction at.

Note: e.g., measurement distance correction for two decades (300m to 3m) is 2*40dB= +80dB.
For one decade (30m to 3m) the distance correction is +40dB.

4.1.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.1.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

SOP 1 Radiated Emissions

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EUT Name	Dosimetry Verification System (DVS) Reader	**Date**	6 December 2005
EUT Model	DVS-R-100	**Temp / Hum in**	75°F / 32%rh
EUT Serial	E01	**Temp / Hum out**	NA
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC / Freq**	120 VAC / 60 Hz
Dist/Ant Used	See Below	**Performed by**	Jim Hope

Emission Freq (MHz)	ANT Polar (p/V)	ANT Pos (m)	Ave FIM Value (dBuV)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
Fundamental frequency measured at 3m in 5m chamber; Emco 6502 Ant. 7405 SA										
0.132			89.65	na	0	0.04	12.0	101.69	105.1	-3.41
Fundamental frequency measured at 3 Meters on OATS using 6502, 7405, cable 36										
0.134			85.65	na	0	.04	12.0	97.69	105.1	-7.41
Fundamental frequency measured at 10 Meters on OATS using 6502, 7405, cable 36										
0.134			64.87	na	0	.04	12.0	76.91	85.1	-8.19
Harmonic and spurious frequencies measured at 3m in 5m chamber; Emco 6502 Ant. 7405 SA										
.4			36.89	na	0	0.06	11.7	48.65	95.6	-46.95
.53			na	37.65	0	0.09	11.7	49.44	73.1	-23.66
.76			na	34.5	0	0.10	11.7	46.3	70.0	-23.7
.8			na	32.55	0	0.11	11.7	44.36	69.5	-25.14
.93			na	31.56	0	0.11	11.7	43.37	68.2	-24.83
1.07			na	29.12	0	0.11	11.8	41.03	67.0	-25.97
1.2			na	28.64	0	0.11	11.8	40.55	66.0	-25.45
1.33			na	27.62	0	0.12	11.8	39.54	65.1	-25.56
1.46			na	26.5	0	0.13	11.8	38.43	64.3	-25.87
1.59			na	25.5	0	0.13	11.8	37.43	63.6	-26.17
1.73			na	23.6	0	0.13	11.8	35.53	69.5	-33.97
1.86			na	24.6	0	0.14	11.8	36.54	69.5	-32.96
2			na	24.6	0	0.14	11.8	36.54	69.5	-32.96
2.8			na	20.55	0	0.18	10.8	31.53	69.5	-37.97
3.06			na	21.6	0	0.19	10.7	32.49	69.5	-37.01
6.46			na	16.65	0	0.27	10.2	27.12	69.5	-42.38
9.17			na	15	0	0.31	10.3	25.61	69.5	-43.89
10.26			na	11.57	0	0.33	10.3	22.2	69.5	-47.3
15.43			na	29.76	0	0.40	10.7	40.86	69.5	-28.64
20.23			na	12.41	0	0.46	10.3	23.17	69.5	-46.33
29.15			na	10.29	0	0.56	9.1	19.95	69.5	-49.55

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.6$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: Limits are adjusted for antenna measurement distance.

The Transmitter has been programmed to operate for a longer time for the EMC testing; therefore the average measurement is about 15 dB higher than with normal operation.

For measurement of frequencies between 110 to 490kHz, the average detector was used. All other measurements are made using the CISPR quasi-peak detector, per FCC part 15.209(d).

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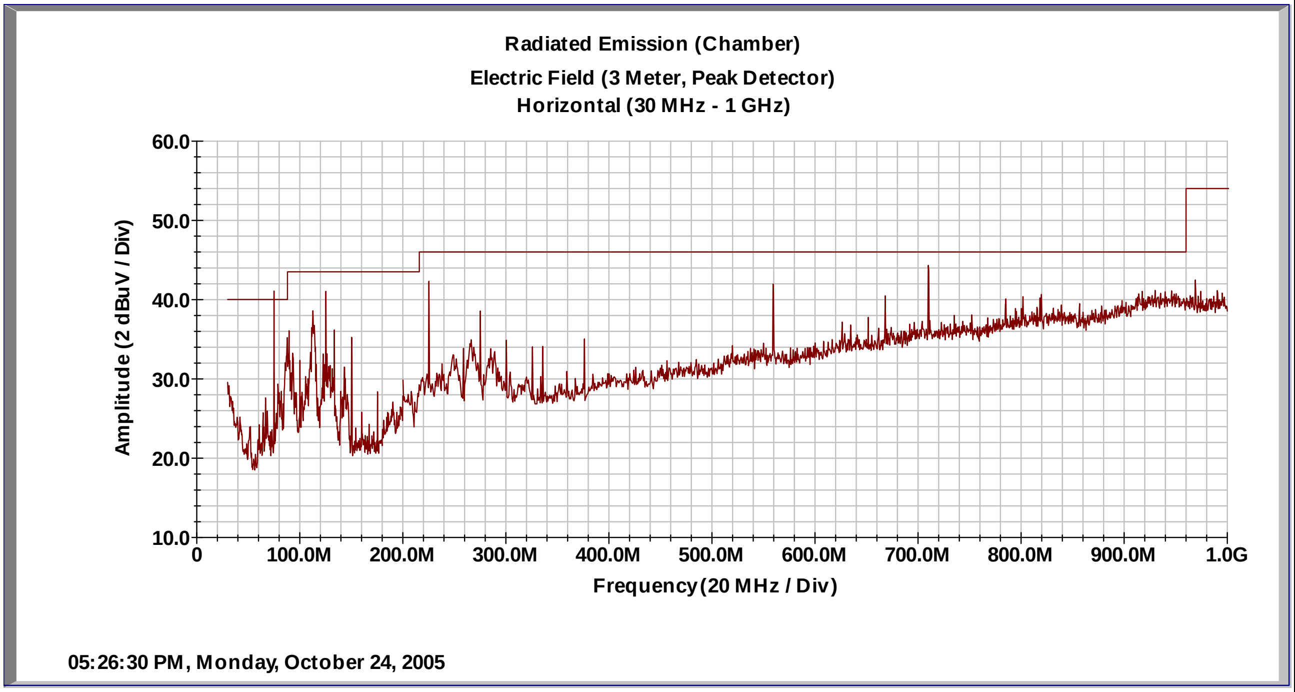
EUT Name	Dosimetry Verification System (DVS) Reader	**Date**	25 October 2005
EUT Model	DVS-R-100	**Temp / Hum in**	70°F / 40%rh
EUT Serial	E01	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC / Freq**	120VAC / 60Hz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	On, and transmitting - FCC part 15.209		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
75.20	H	2.5	245	31.12	0.00	0.90	6.99	39.01	40.00	-0.99
125.32	H	2	105	34.59	0.00	1.18	7.10	42.87	43.50	-0.63

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

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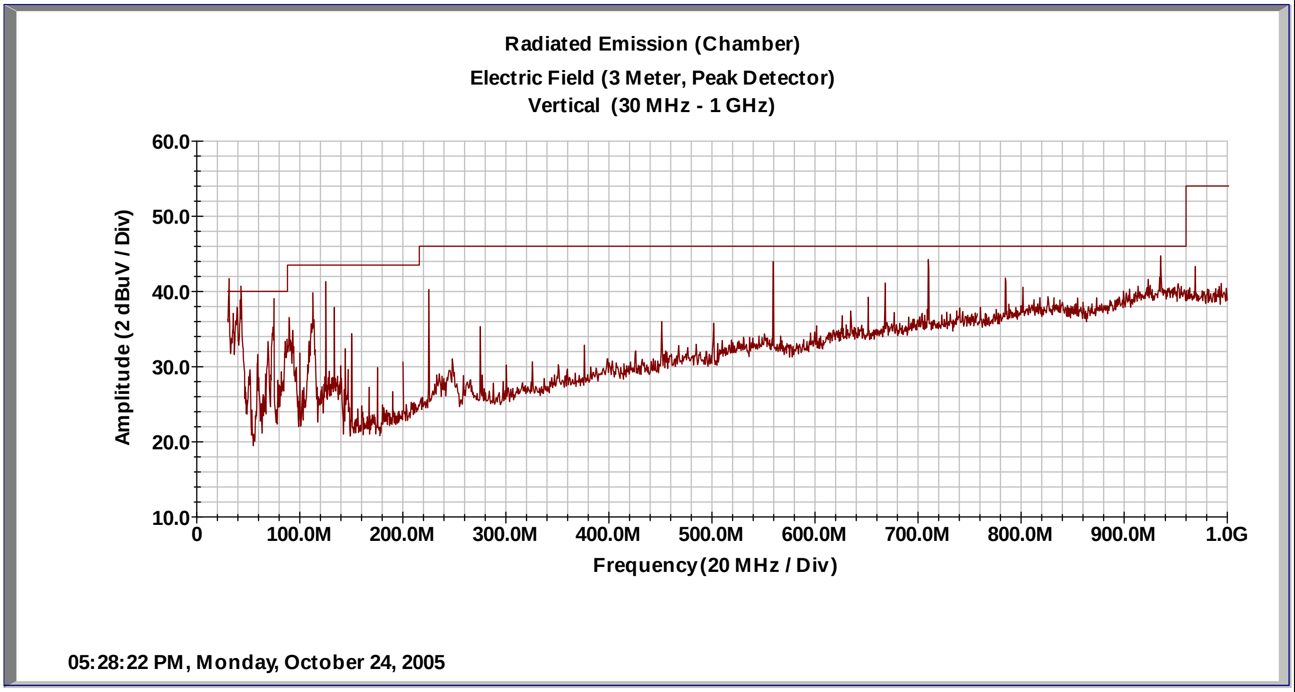
EUT Name	Dosimetry Verification System (DVS) Reader	**Date**	25 October 2005
EUT Model	DVS-R-100	**Temp / Hum in**	70°F / 40%rh
EUT Serial	E01	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC / Freq**	120VAC / 60Hz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	On, and transmitting - FCC part 15.209		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
75.20	V	3.6	356	30.50	0.00	0.90	5.89	37.29	40.00	-2.71
125.80	V	1	29	34.83	0.00	1.18	7.28	43.29	43.50	-0.21
275.64	V	1.3	272	21.21	0.00	1.80	12.70	35.71	46.00	-10.29
688.60	V	1.5	221	18.41	0.00	2.86	20.47	41.74	46.00	-4.26
743.44	V	1.5	129	18.59	0.00	2.97	20.53	42.10	46.00	-3.90
965.12	V	1	173	16.00	0.00	3.42	22.30	41.72	54.00	-12.28

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

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EUT Name	Dosimetry Verification System (DVS) Reader	**Date**	25 October 2005
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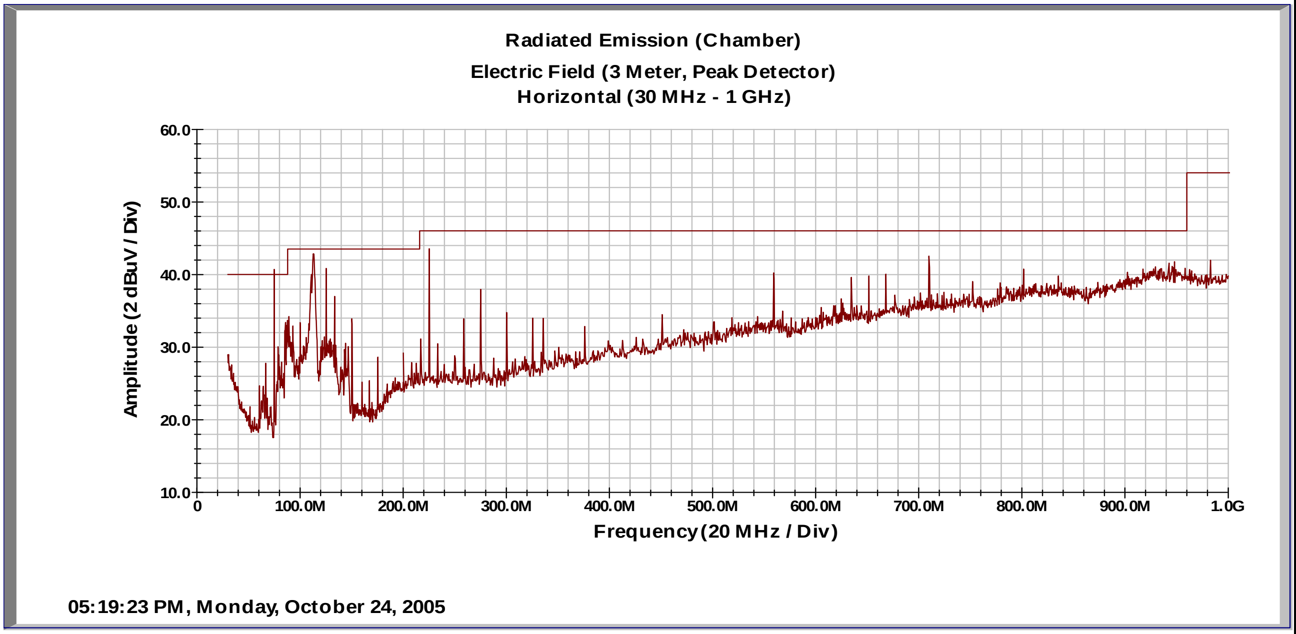
EUT Serial	E01	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC / Freq**	120VAC / 60Hz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	On, but not transmitting – FCC Part 15.109		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
75.16	H	2.5	258	35.42	0.00	3.90	-1.00	38.32	40.00	-1.68
111.75	H	1.5	105	30.80	0.00	4.11	-1.00	33.91	43.50	-9.59
125.28	H	1.5	251	34.94	0.00	4.18	-1.00	38.12	43.50	-5.38

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

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EUT Name	Dosimetry Verification System (DVS) Reader	**Date**	25 October 2005
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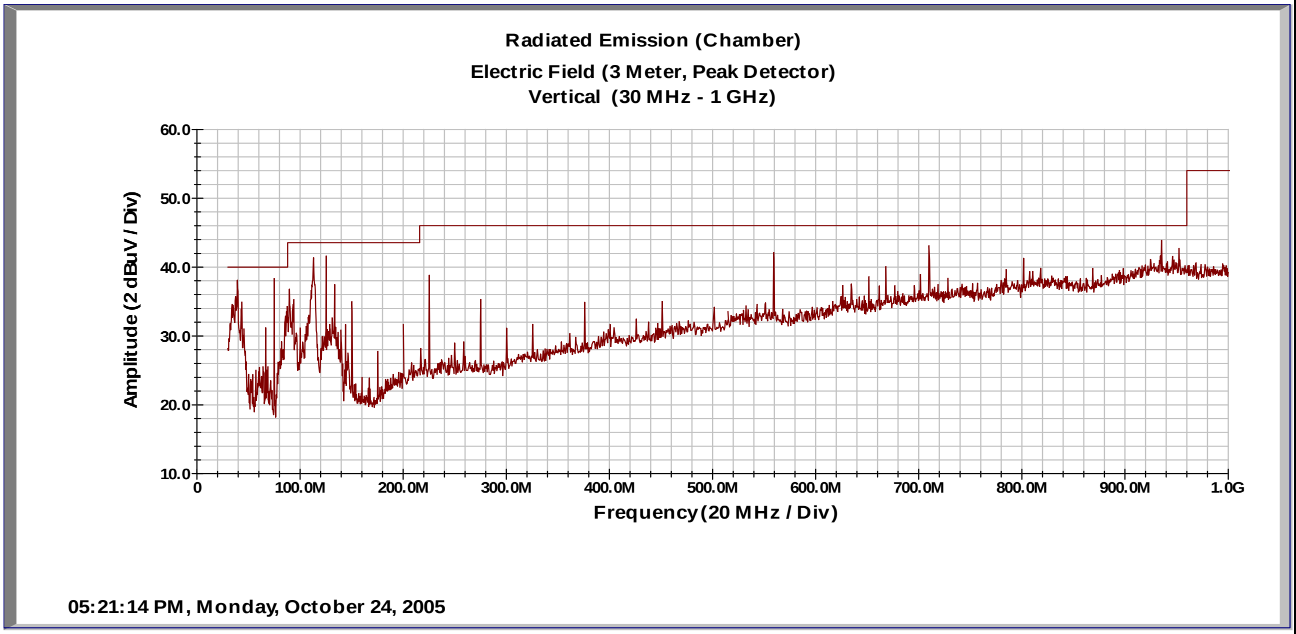
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC / Freq**	120VAC / 60Hz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	On, but not transmitting - FCC Part 15.109		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
75.20	V	3.7	353	31.93	0.00	3.90	-1.00	34.83	40.00	-5.17
112.56	V	1.7	13	28.46	0.00	4.12	-1.00	31.58	43.50	-11.92
125.32	V	1.2	19	33.98	0.00	4.18	-1.00	37.16	43.50	-6.34

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

4.1.3 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM - AMP + CBL + ACF

Where:
FIM = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.2 Conducted Emissions

Testing was performed in accordance with FCC §15.207(a). These test methods are listed under the laboratory's NVLAP Scope of Accreditation.

This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.2.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. For each frequency sub-range, each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50μH / 50Ω LISNs.

Testing is either performed in the anechoic chamber or on PLC Site 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the anechoic chamber is a 2m x 2m wooden frame that is covered with ¼ inch hardware cloth and is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN. Floor-standing equipment is placed directly on the ground plane.

4.2.1.1 Deviations

There were no deviations from this test methodology.

4.2.2 Test Results

Section 4.2.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

Plots of the EUT's AC Line Conducted emissions are contained in the following sections. The plots show peak and/or average emissions and the corresponding peak and/or average limits. If the peak emissions are below the average limit, then the EUT is considered to pass and no average measurements are made. If the peak emissions are below the quasi-peak limit and the average emissions are below the average limit, then the EUT is considered to pass and no further measurements are made. Otherwise, individual frequencies are measured and compared to the corresponding limit for the detector used (quasi-peak or average).

4.2.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

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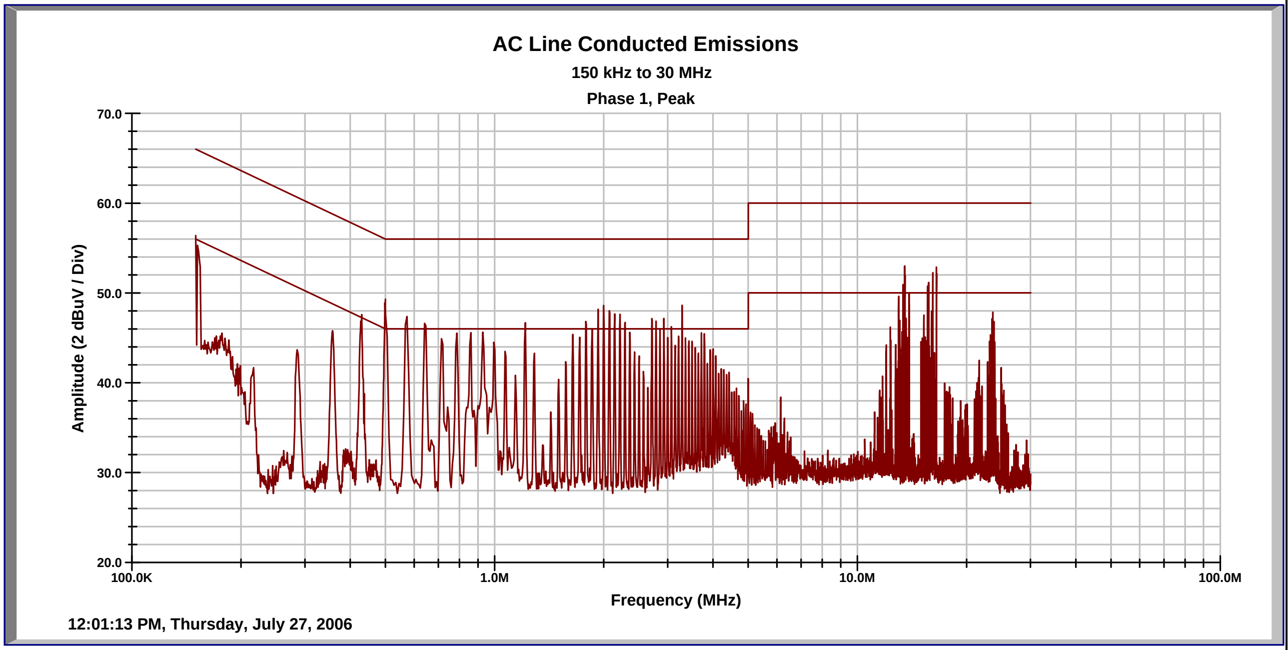
EUT Name	**Dosimetry Verification System** (DVS) Reader	**Date**	25 October 2005
EUT Model	**DVS-R-100**	**Temperature**	70°F
EUT Serial	E01	**Humidity**	40%rh
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC/Freq**	120VAC / 60Hz
LISNs Used	1	**Performed by**	Mark Ryan
Configuration	Operational, with transmitter on; Phase 1 FCC Part 15.207		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.15	1	23.11	1.11	0.00	10.02	66.00	56.00	-32.87	-44.87
0.50	1	32.78	32.65	0.02	10.04	56.00	46.00	-13.16	-3.29
2.00	1	35.83	33.63	0.04	10.07	56.00	46.00	-10.06	-2.26
3.14	1	29.82	27.52	0.05	10.11	56.00	46.00	-16.02	-8.32
13.48	1	11.28	5.81	0.13	10.48	60.00	50.00	-38.11	-33.58
16.54	1	8.87	2.87	0.14	10.48	60.00	50.00	-40.51	-36.51

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

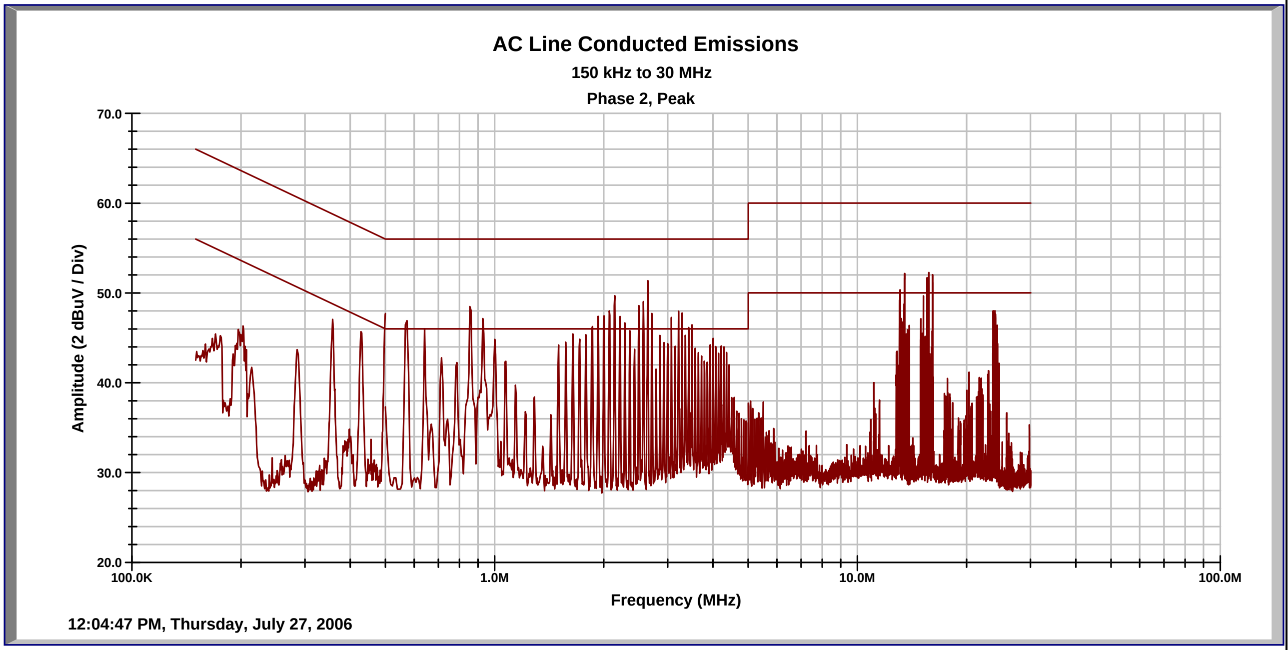
Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

SOP 2 Conducted Emissions

Tracking # 30562169.003 Page 2 of 4

EUT Name	**Dosimetry Verification System** (DVS) Reader	**Date**	25 October 2005
EUT Model	**DVS-R-100**	**Temperature**	70°F
EUT Serial	E01	**Humidity**	40%rh
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC/Freq**	120VAC / 60Hz
LISNs Used	2	**Performed by**	Mark Ryan
Configuration	Operational, with transmitter; on Phase 2 FCC Part 15.207		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.15	2	23.60	7.77	0.00	10.11	66.00	56.00	-32.29	-38.11
0.50	2	37.51	34.41	0.02	10.10	56.00	46.00	-8.37	-1.47
2.00	2	33.71	32.44	0.04	10.07	56.00	46.00	-12.18	-3.45
3.14	2	29.73	26.32	0.05	10.11	56.00	46.00	-16.11	-9.52
13.49	2	15.37	18.07	0.13	10.48	60.00	50.00	-34.02	-21.32

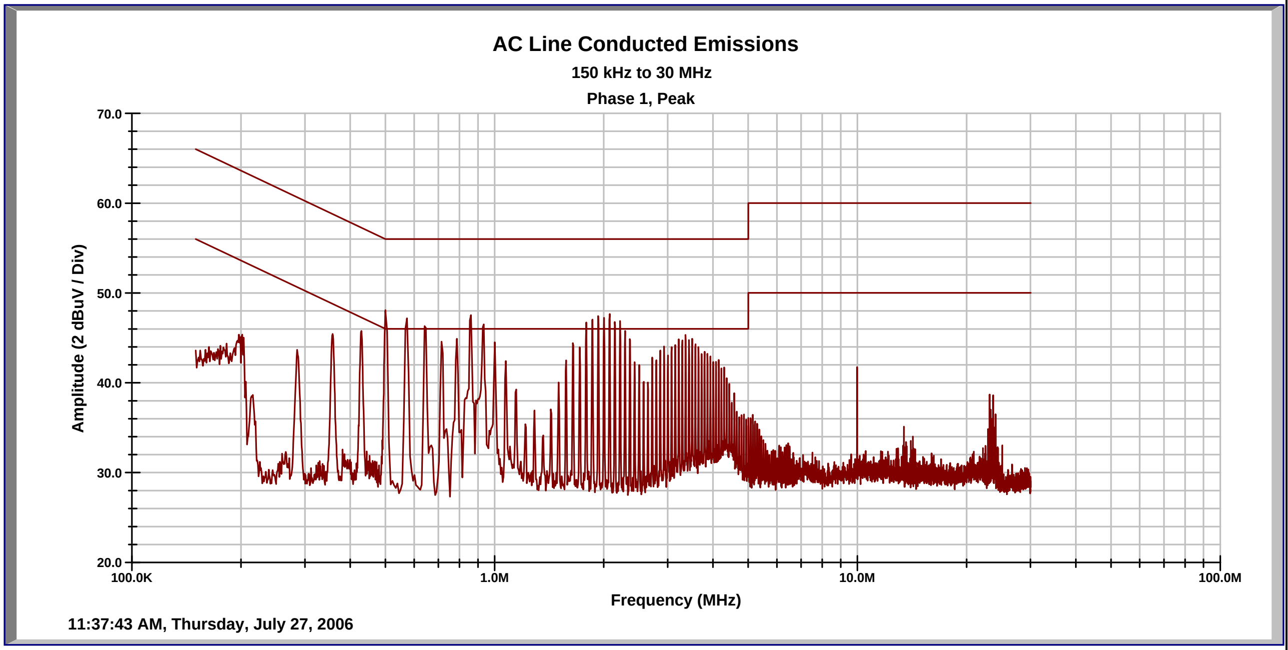
Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

SOP 2 Conducted Emissions — Tracking # 30562169.003 Page 3 of 4

EUT Name	**Dosimetry Verification System (DVS) Reader**	**Date**	25 October 2005
EUT Model	**DVS-R-100**	**Temperature**	70°F
EUT Serial	E01	**Humidity**	40%rh
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC/Freq**	120VAC / 60Hz
LISNs Used	1	**Performed by**	Mark Ryan
Configuration	Operational with transmitter off; Phase 1 - FCC Part 15.107(a)		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.18	1	27.97	6.71	0.01	10.02	64.49	54.49	-26.49	-37.74
0.50	**1**	**37.21**	**34.13**	**0.02**	**10.04**	**56.00**	**46.00**	**-8.73**	**-0.81**
0.86	1	36.15	33.36	0.02	10.05	56.00	46.00	-9.78	-2.57
2.00	1	36.83	33.65	0.04	10.07	56.00	46.00	-9.06	-2.24
3.15	1	33.05	30.98	0.05	10.12	56.00	46.00	-12.78	-4.85
23.59	1	12.48	6.71	0.18	10.47	60.00	50.00	-36.87	-32.64

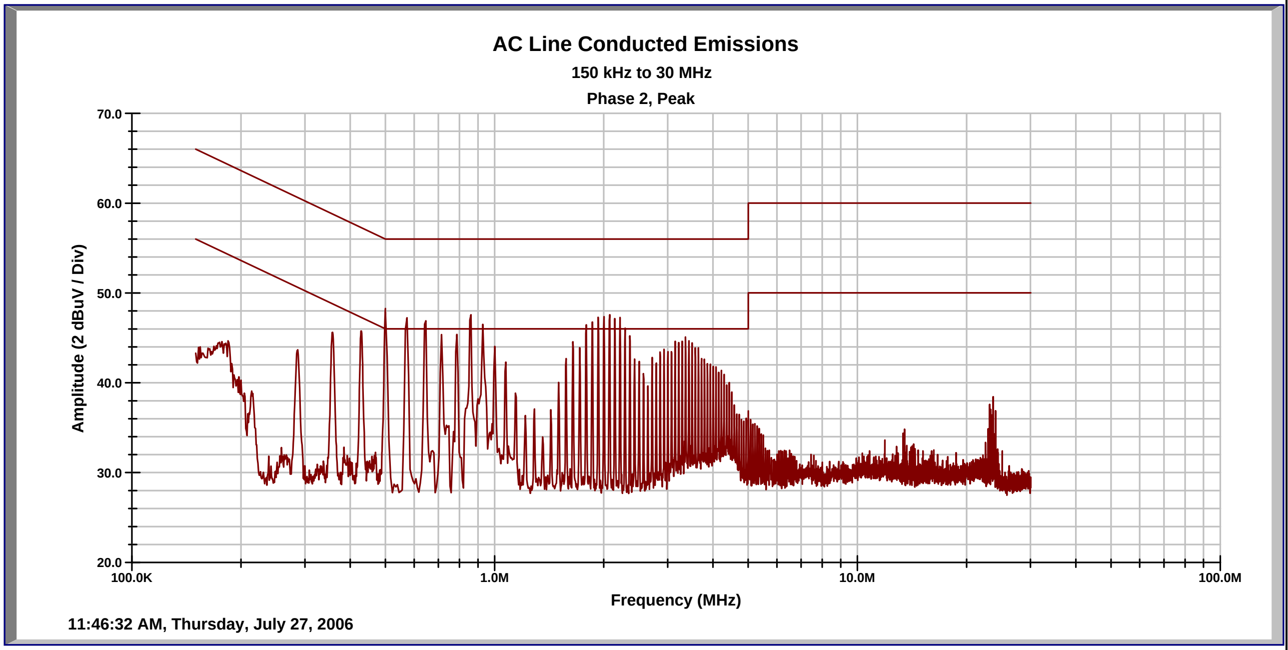
Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: The emission shown in **BLUE** is the worst case conducted emissions.

SOP 2 Conducted Emissions   Tracking # 30562169.003 Page 4 of 4

EUT Name	**Dosimetry Verification System (DVS) Reader**	**Date**	25 October 2005
EUT Model	**DVS-R-100**	**Temperature**	70°F
EUT Serial	E01	**Humidity**	40%rh
Standard	FCC 47 CFR Part 15 - Subpart C	**Line AC/Freq**	120VAC / 60Hz
LISNs Used	2	**Performed by**	Mark Ryan
Configuration	Operational with transmitter off, Phase 2 - FCC Part 15.107(a)		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.17	2	28.73	5.80	0.01	10.11	64.96	54.96	-26.11	-39.04
0.50	2	37.25	35.15	0.02	10.10	56.00	46.00	-8.63	-0.73
0.86	2	36.27	33.60	0.02	10.07	56.00	46.00	-9.64	-2.31
2.00	2	36.45	32.16	0.04	10.07	56.00	46.00	-9.44	-3.73
3.14	2	36.81	32.63	0.05	10.11	56.00	46.00	-9.03	-3.21
23.59	2	12.43	6.85	0.18	10.47	60.00	50.00	-36.92	-32.50

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB   Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

4.2.3 Sample Calculation

The signal strength is calculated by adding the LISN Correction Factor and Cable Loss to the measured reading. The basic equation is as follows:

Field Strength (dBµV/m) = FIM + CBL + LCF

Where: FIM = Field Intensity Meter (dBµV)
CBL = Cable Loss (dB)
LCF = LISN Loss (dB)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.3 Frequency Stability

Testing was performed in accordance with FCC §15.31(e). This test evaluates the frequency stability of the EUT caused by 85% to 115% voltage variation on the AC mains power.

4.3.1 Test Methodology

The test methodology is as described in section 4.1.1 except only the intentional radiated frequency is to be measured. Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.3.1.1 Deviations

The EUT has a nominal rated voltage from 100VAC to 240VAC. Therefore the test voltages will be 85VAC and 271VAC respectfully.

4.3.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standards.

4.3.3 Test Plots

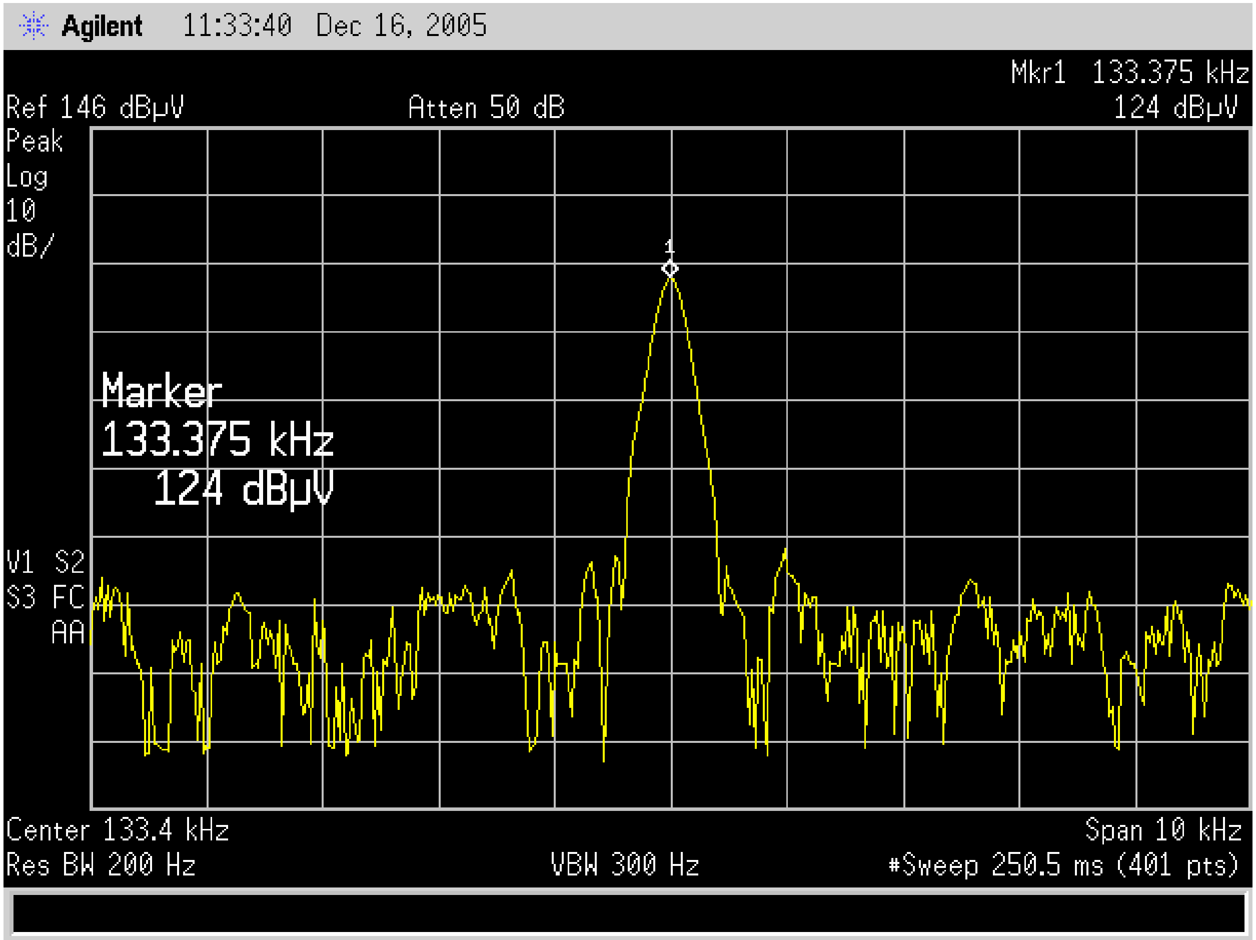


Figure 1 – Nominal voltage (120VAC)

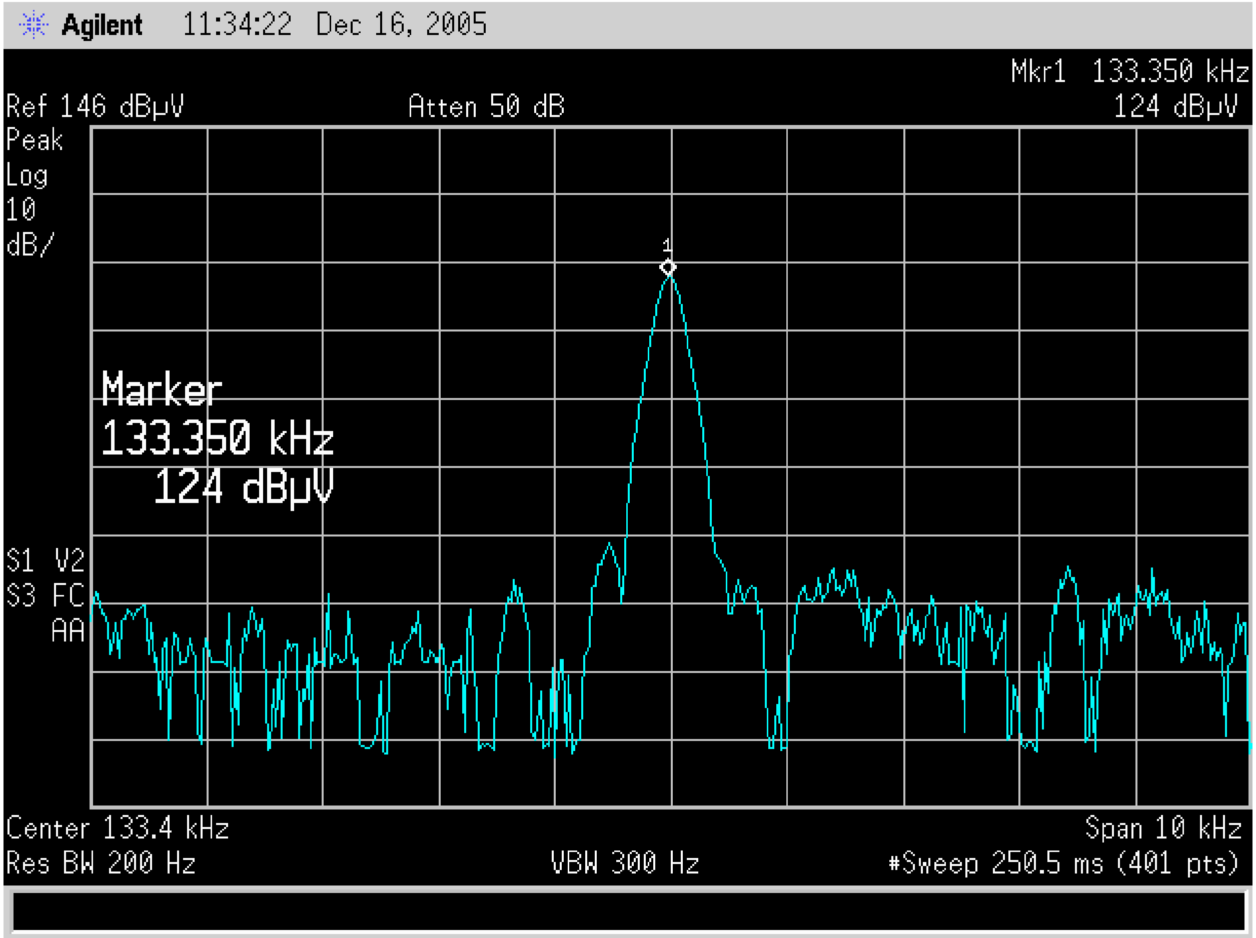


Figure 2 – 85% Nominal of nominal rated voltage (85VAC)

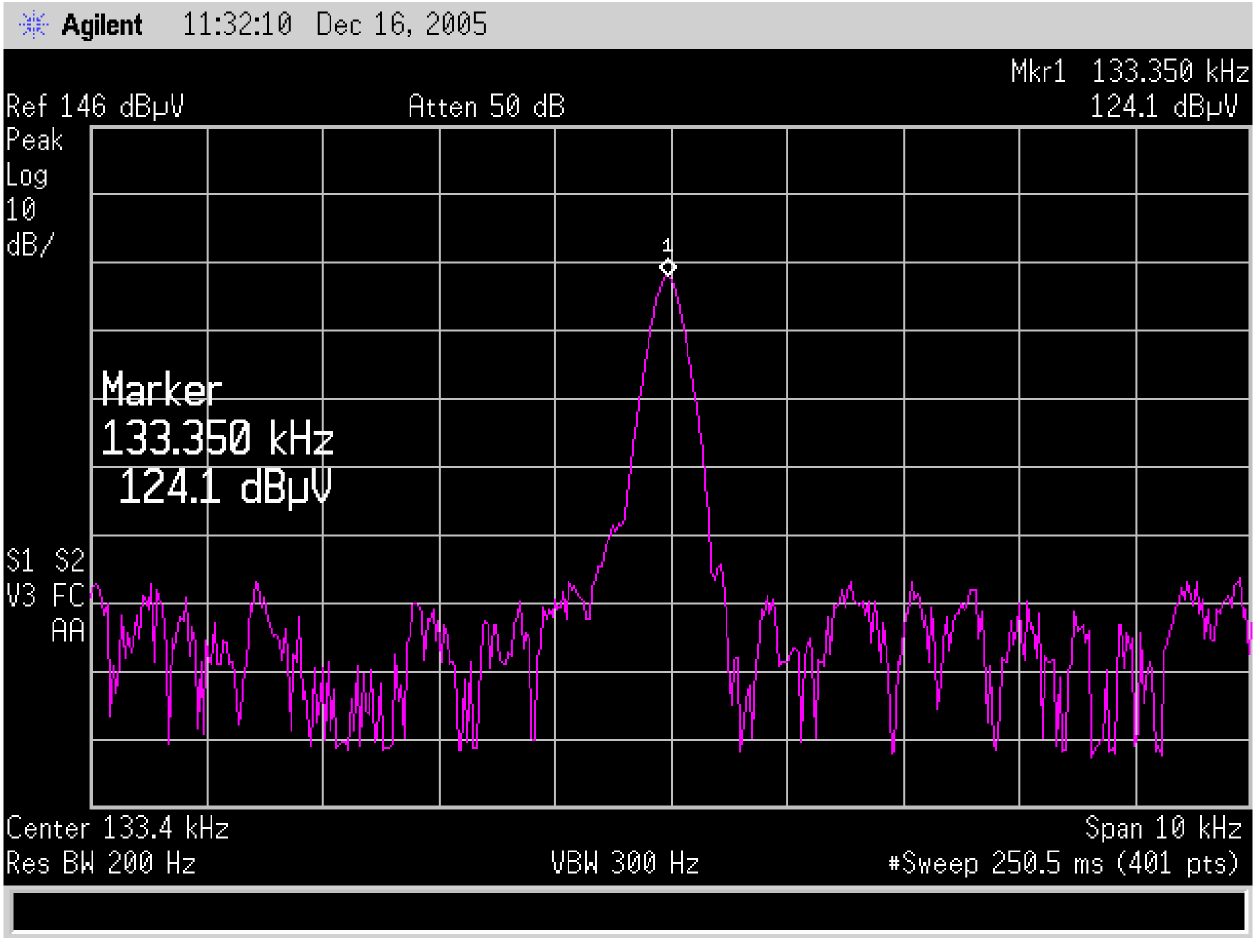


Figure 3 – 115% Nominal of nominal rated voltage (271VAC)

4.4 Bandwidth

Testing was performed in accordance with FCC §15.215(c). This test is to verify that the intentional radiator emission is contained within the frequency band designated.

4.4.1 Test Methodology

The stability at this frequency is not specified in the regulations. Therefore the fundamental emission must be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation. A plot of the fundamental emission will and the 20dB bandwidth will be measured and a determination will be made if it is compliant.

4.4.1.1 Deviations

The 99% Bandwidth plot below was made for Industry Canada (appendix B) however it demonstrates the bandwidth compliance for FCC §15.215(c). The frequency and bandwidth is well within operating band.

4.4.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.4.3 Test Plot

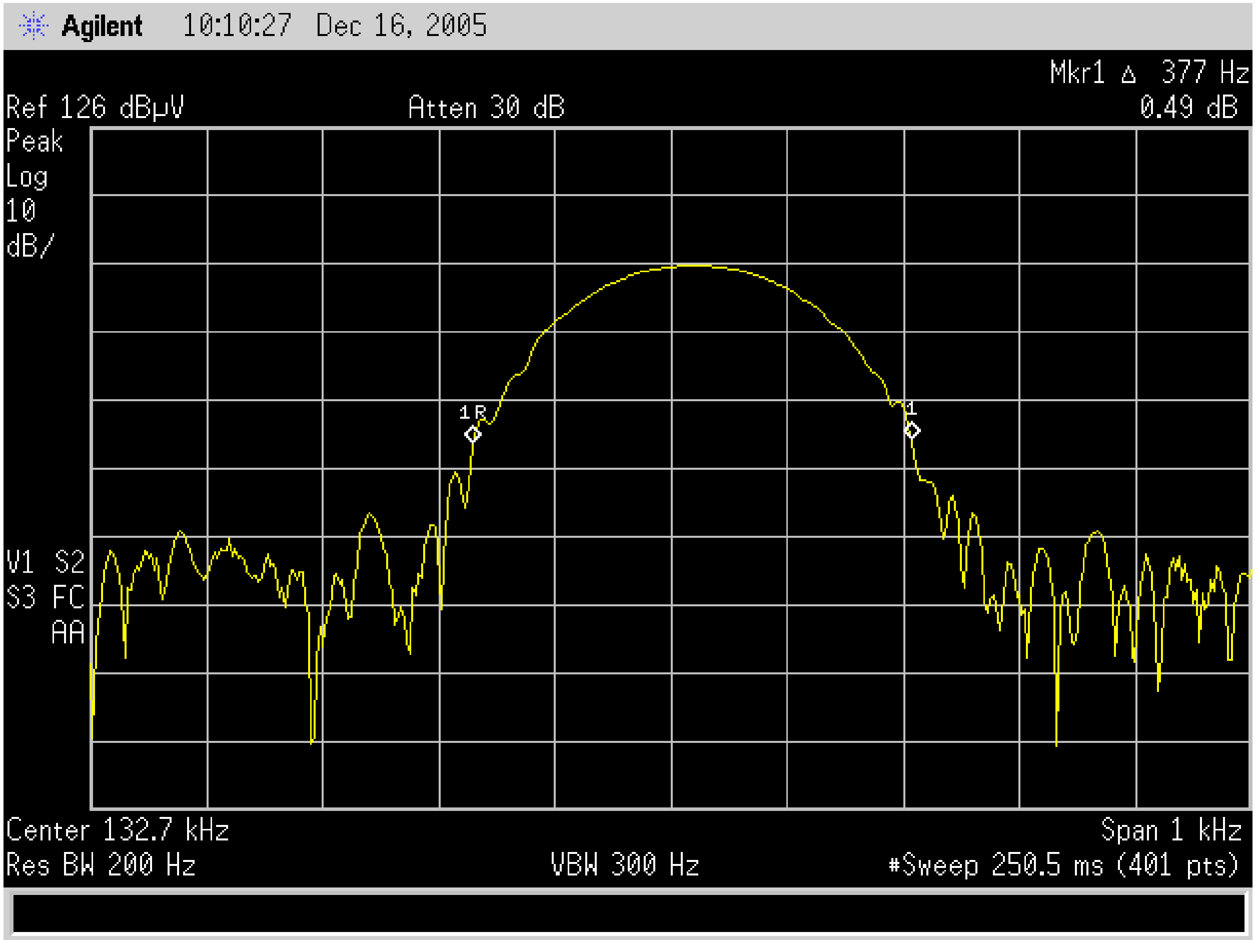


Figure 4 – 99% Bandwidth measurement of fundamental emission.

5 Test Equipment Use List

5.1 Lab Test Equipment

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (5 Meter Chamber)					
Ant. Biconical	EMCO	3110B	3367	24-Feb-05	24-Feb-06
Ant. Log Periodic	AH Systems	SAS-516	133	7-Feb-05	7-Feb-06
Ant. BiconiLog	EMCO	3142	1006	13-Apr-2005	13-Apr-2006
Antenna Loop	EMCO	6502	3336	3-May-2005	3-May-2006
Cable, Coax	Andrew	FSJ1-50A	030	18-Jan-05	18-Jan-06
Cable, Coax	Andrew	FSJ1-50A	036	18-Jan-05	18-Jan-06
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	22-Jan-05	22-Jan-06
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	3-Aug-05	3-Aug-06

SOP 2 - Conducted Emissions					
Cable, Coax	Andrew	FSJ1-50A	049	18-Jan-05	18-Jan-06
LISN (1) 50mH/50Ω	Solar Electronics	8028-50-TS-24	944016	5-Aug-05	5-Aug-06
LISN (2) 50mH/50Ω	Solar Electronics	8028-50-TS-24	9212106	5-Aug-05	5-Aug-06
Spectrum Analyzer	Agilent Tec.	E7405A	US39440157	4-Aug-05	4-Aug-06

6 EMC Test Plan

6.1 Test Plan

The attached EMC test plan has been generated by the manufacturer and implemented as recorded in this test report.

Introduction

This manufacturer-supplied document provides a description of the Equipment Under Test (EUT), configuration(s), operating condition(s), and performance acceptance criteria. It is intended to provide the test laboratory with the essential information needed to perform the requested testing.

Customer

The information in the following tables is required, as it should appear in the final test report.

Table 2 – Manufacturer Information

Company Name:	Sicel Technologies, Inc.
Street Address:	3800 Gateway Centre Blve., Ste. 308
City, State, Zip Code:	Morrisville, NC 27560
Tel:	919-465-2236
Fax:	919-465-0153

Table 3 – Technical Contact Information

Contact Name	Telephone	Fax	Email address
Brendan McSoley	**919-465-2236x230**	**919-465-0153**	**bmcsoley@siceltech.com**

Equipment Under Test (EUT)

Table 4 – EUT Designation

Model Name:	Dosimetry Verification System (DSV) Reader
Model Number(s):	DSV-R-100

Technical Description

DVS – Dose Verification System

The Dose Verification System (DVS) is used to measure radiation dose received at a tumor site in a patient who is undergoing radiation therapy. The figure below depicts the components of the DVS. The DVS Dosimeter is implanted in a patient near a tumor. It contains a radiation sensor that is used to measure the amount of radiation received. The Wand is used to (a) Power the Dosimeter using an electromagnetic field, (b) transmit requests to the Dosimeter, and (c) receive data from the Dosimeter by decoding the FSK backscatter modulation.

The Base Station contains a panel PC with integrated touch-screen that communicates with the Wand (via RS-232) and provides the user interface. Ethernet to the DVS hardware is a Database Server computer (connected via an Ethernet LAN) that collects the data read from the Dosimeter. The Database Server is not part of the EUT, though it is needed for the system to function.

DIAGRAM OF EQUIPMENT CONFIGURATION FOR TESTING

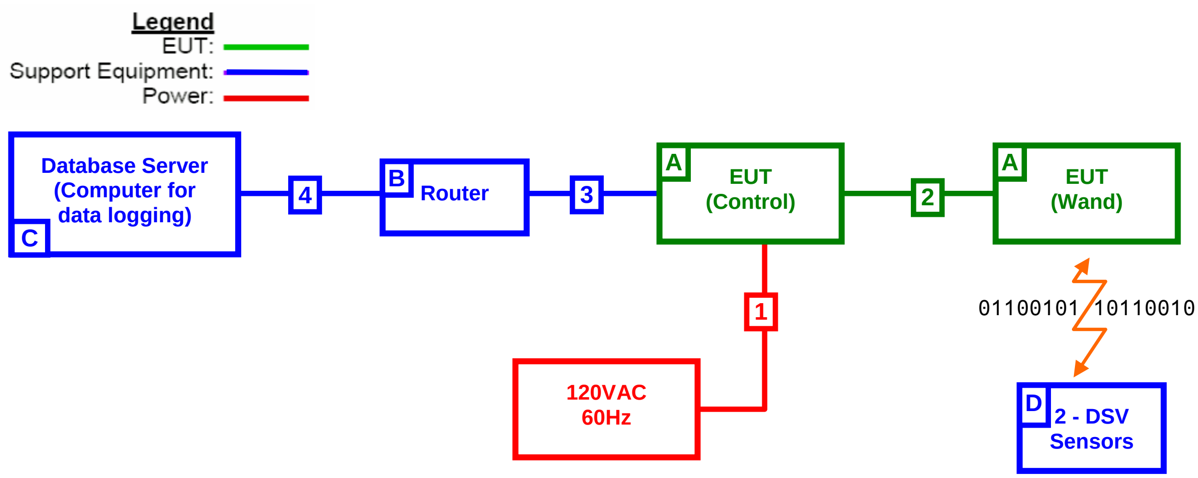


Figure 5 - Block Diagram of EUT Set-Up

Table 5 – Equipment Chassis Shown in Block Diagram

Des.	Supplier	Model No.	Serial No.	Description
A	Sicel Tech.	DSV Base Station and Wand	917-00514-00 Rev. 03 917-00552-00 Rev. 02	DVS Telemetric Reader
B	Linksys	BEFSR41	C210C1064	DSL Network Router
C	Dell	Inspiron 4000	32974405345	Laptop Computer
D	Sicel Tech	DSV Sensors	67108869 & 67108913	Implantable DSV Sensors

Table 6 – Cables Shown in Block Diagram

Cable Number	Description	Shielding	Length
1	AC Mains cord – 3 cond. (Provided w/ EUT)	Unshielded	3.0m
2	Coiled Wand Cable (part of EUT)	Shielded	2m
3	CAT 5 Network Cable (part of support equipment)	Unshielded	45cm
4	CAT 5 Network Cable (part of support equipment)	Unshielded	7.6m

Table 7 – Cables Shown in Block Diagram

Des.	Manufacturer	Model No.	Revision	Serial No.	Description
A	Sicel Tech.	917-00550-00	02	-	TX/RX antenna board
A	Sicel Tech.	917-00551-00	02	-	Controller board
A	Arista	ARP-1606AP	-	A8D0000629	Panel PC
A	Jerome Ind.	CLS806M	-	2	Power Supply – 5V & 12V
A	Elpac Power Supplies	MMM4015	C	000989	Power Supply – 15V
A	Corcom	PE0S0DHXB	-	-	Power entry w/ EMI filter

Operating Conditions

The EUT will be tested in a "typical" operating mode consistent with its intended use. Each operating mode will be investigated and the worst case will be tested.

Software

Software used to operate the EUT;

- Wand Firmware v1.0.6
- Base Station Software v1.1.2-UL

Mode(s)

There are two typical operating modes:

1. The EUT is powered on, but the Wand is not transmitting. To setup the EUT for this mode, simply turn on the power and wait for the login screen.
2. The EUT is powered on and the Wand is transmitting to communicate with the Dosimeter. This mode produces the highest emissions.

To set up the system for mode 2, follow these steps:

1. Turn on the power and wait for the login screen.
2. Select “Therapist 1”
3. Touch the Password field, and use the on-screen keyboard to enter password “1111”. Press the “Enter” key when done.
4. Press the “Test Dosimeter” key, then the “Enter” key.
5. In the “Dosimeter 1” field, enter “67108869”.
6. In the “Dosimeter 1” field, enter “67108913”.
7. Press the button on the Wand to start scanning continuously for the Dosimeters.
8. When done, Hold the button on the Wand until the status screen stops scrolling.

The time to complete one operation cycle is 1.5 to 2.0 seconds.

Performance Criteria (Required for Immunity Testing Only)

Performance criteria will be as stated in EN 60601-1-2:2001 section 36.202.1 j) all modes of operation.

Manufacturer Specific Performance Criteria

Mode 1: (non-transmitting): The display and touch-screen will remain operational.

Mode 2: (transmitting): The reader will be able to receive the information transmitted by the Dosimeter. The Database Computer contains a SQL database that will be updated with the information received from the Dosimeter, through the Reader. The Dosimeter should be read within 30 seconds at a range of four (4) inches. The system is allowed to receive BAD data provided that the data is flagged as BAD.

Power Requirements

Table 8 – Rated Power Requirements

Parameter	Value
Input Voltage	100~240 VAC
Input Frequency	50 – 60 Hz
Power	1A at 120VAC
# of phases	Single Phase

Note: Use only 120VAC / 60Hz power for all tests.

Table 9 – Oscillator Frequency List

Frequency	Description of Use
16 MHz	Microcontroller in Wand
300 MHz	Microcontroller in Base Station