Nemko Test Report:	12232RUS1Rev1
Applicant:	Culligan International Co. 9399 West Higgins Road, Ste 100 Rosemont, IL 60018 USA
Equipment Under Test: (E.U.T.)	Smart Sensor Controller
In Accordance With:	**FCC Part 15, Subpart C, 15.249 and Industry Canada RSS-210, Issue 7** Operation within the bands 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz, and 24.0-24.25 GHz.
Tested By:	Nemko USA Inc. 802 N. Kealy Lewisville, Texas 75057-3136

TESTED BY: Scott Oates — **DATE:** **29 April 2008**

Scott Oates, EMC Engineer

APPROVED BY: David Light — **DATE:** **30 April 2008**

David Light, Senior Wireless Engineer

Total Number of Pages: 22

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Section 1. Summary Of Test Results

Manufacturer: Culligan International Co.

Model No.: Smart Sensor Advanced Gold Series

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15.249 and Industry Canada RSS-210. All tests were conducted using measurement procedure ANSI C63.4-2003. Radiated Emissions were made in a semi-anechoic chamber which is on file with the FCC and Industry Canada.

☒	New Submission	☒	Production Unit
☐	Class II Permissive Change	☐	Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.
See " Summary of Test Data".

NVLAP LAB CODE: 100426-0

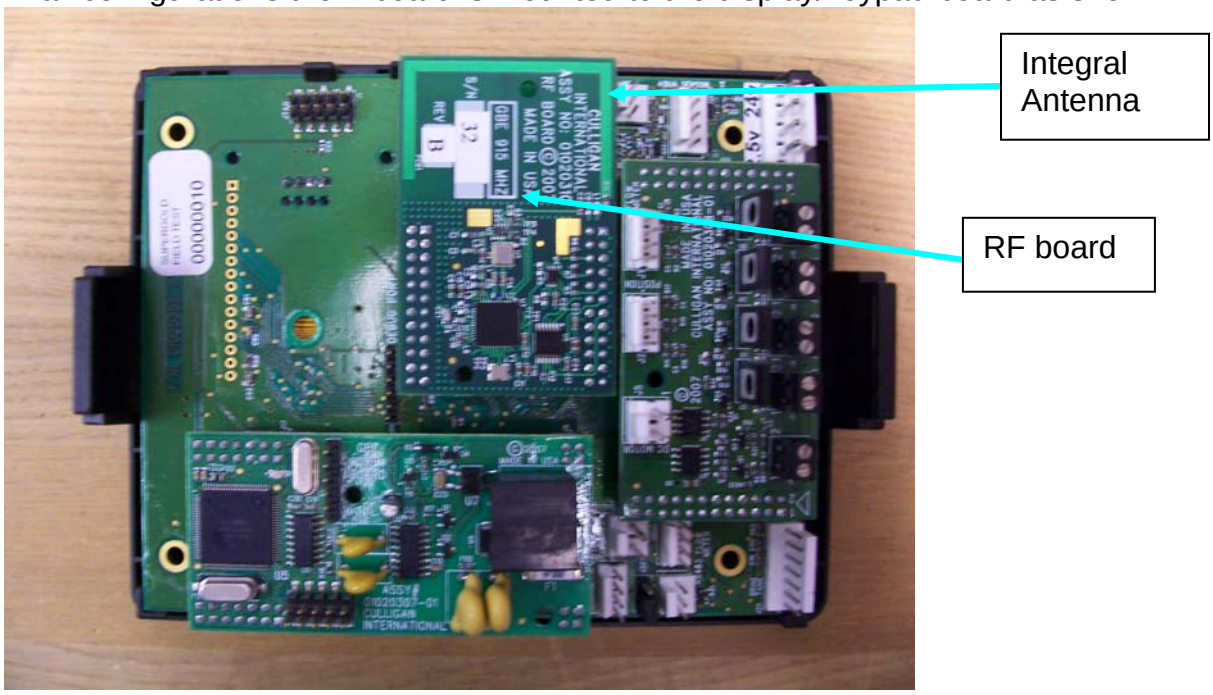
Summary Of Test Data

NAME OF TEST	PARA. NO.	RESULT
Conducted Emissions	FCC 15.207 / RSS-Gen 7.2.2	Complies
Radiated Emissions	FCC 15.249 / RSS-210 A2.9	Complies

Description of EUT

RF Transmitter: This module is installed into the controller to allow it to communicate with a remote via Radio Frequency communications. The module communicates at 915 MHz and is designed to work without interference with other 915 MHz devices such as cordless telephones and baby monitors.

In all configurations the rf board is mounted to the display/keypad board as shown:



Enclosures: The RF module was evaluated for use in the following enclosures:

Configuration #1

Photo 1 - 01018857 "Super Gold"

Configuration #2

Photo 2 – 01020677 Global Control for CSM

Configuration #3

01020676 Global Control for HF42/50 - exactly same as 01020677, but shipped with a different mounting bracket. No photo. Appearance is the same as above.

Configuration #4

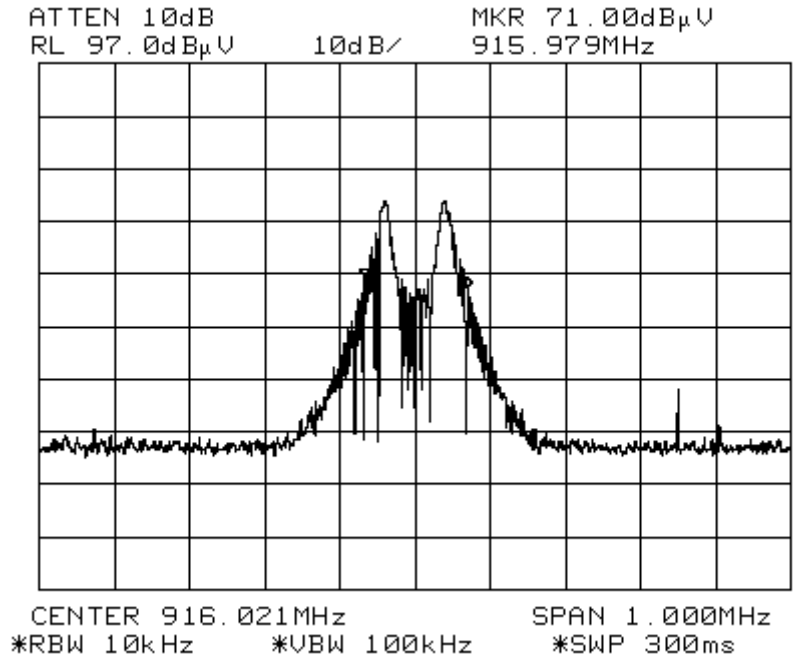
Photo 3 - 01021291 Global Control for G Series RO

Photo 4 - 01021291 Global Control for G Series RO

Section 2. General Equipment Specification

Frequency Range:	915 MHz
Operating Frequency(ies) of Sample:	915 MHz
Tunable Bands:	None (fixed frequency)
Number of Channels:	One
Channel Spacing:	NA
User Frequency Adjustment:	None

	Yes	No
Integral Antenna	☒	☐



99% Occupied Bandwidth plot

Section 3. Powerline Conducted Emissions

NAME OF TEST: Powerline Conducted Emissions	FCC 15.207 and RSS-Gen 7.2.2
TESTED BY: Scott Oates	DATE: 30 April 2008

Minimum Standard: §15.207 Conducted limits.

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 mH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBmV) Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

Test Results: Complies. The worst case emission was 47.6 dBµV at 322.3 kHz on Line 2. This is 13.5 dB below the quasi-peak specification limit of 61.1 dBµV.

Measurement Data: See attached table.

Method of Measurement: (Procedure ANSI C63.4-2003)

Measurements were made using a spectrum analyzer with 10 kHz RBW, Peak Detector. Any emissions that are close to the limit are measured using a test receiver with 10 kHz bandwidth, CISPR Quasi-Peak Detector.

Test Data – Powerline Conducted Emissions

Line 1

Frequency (kHz)	15.207 QP LIMIT	15.207 AVG LIMIT	AVG Meas	AVG Margin	QP Meas	QP Margin
256.6	63.0	53.0	24.4	-28.6	41.0	-22.0
260.9	62.8	52.8	24.4	-28.4	41.9	-20.9
304.5	61.6	51.6	23.3	-28.2	38.6	-23.0
260.9	62.8	52.8	24.4	-28.4	41.9	-20.9
256.6	63.0	53.0	24.4	-28.6	41.0	-22.0

Line 2

Frequency (kHz)	15.207 QP Limit	15.207 AVG Limit	AVG Meas	AVG Margin	QP Meas	QP Margin
261.2	62.8	52.8	28.6	-24.2	46.9	-16.0
262.3	62.8	52.8	28.6	-24.2	46.7	-16.1
270.8	62.6	52.6	28.3	-24.3	45.8	-16.8
311.3	61.4	51.4	28.3	-23.1	47.1	-14.3
322.3	61.1	51.1	28.5	-22.5	47.6	-13.5
968.2	56.0	46.0	24.0	-22.0	39.7	-16.3

Test Equipment Used: 1663-1443-1258-572-1548-1562

Test Conditions: 38% RH
24ºC

Measurement Uncertainty: +/-3.7 dB

Test Setup Photos

Section 4. Radiated Emissions

NAME OF TEST: Radiated Emissions	FCC 15.249 and RSS-210 A2.9
TESTED BY: Scott Oates	DATE: 29 April 2008

Minimum Standard: Para no. 15.249

(a) The field strengths shall not exceed the following:

Carrier (MHz)	Field Strength (mV/m)	Field Strength (dBμV)	Harmonic (μV/m)	Harmonic (dBμV)
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54
24000-24250	250	108	2500	68

(b) Field strength limits are specified at a distance of 3 meters.

(c) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated limits of 15.209 whichever is the less attenuation.

(d) …for frequencies above 1000 MHz, the above field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

Test Results: Complies. The worst case emission was 92 dBμV/m at 3 meters. This is 2 dB below the specification limit of 94 dBμV/m

Measurement Data: See attached table.

Test Data – TX Radiated Emissions

Frequency (MHz)	Limit (dBµV/m)	Measurement (dBµV/m)	Delta (dB)	Polarity
915	94	92	-2.0	H
1830	54	34.5	-19.5	H
2745	54	35.8	-18.2	H
3660	54	37.0	-17.0	H
4575	54	38.6	-15.4	H
5490	54	41.0	-13.0	H
6405	54	41.2	-12.8	H
7320	54	42.9	-11.1	H
8235	54	44.9	-9.1	H
9150	54	44.5	-9.5	H
915	94	87.3	-6.7	V
1830	54	35.7	-18.3	V
2745	54	35.8	-18.2	V
3660	54	37.3	-16.7	V
4575	54	40.0	-14.0	V
5490	54	41.7	-12.3	V
6405	54	41.8	-12.2	V
7320	54	43.0	-11.0	V
8235	54	44.6	-9.4	V
9150	54	44.3	-9.7	V

Receiver bandwidth: 120 kHz below 1000 MHz, 1 MHz above 1000 MHz.
Detector: Peak

Test Equipment Used: 1304-1298-1042-1625-1016-1763-1762-1767

Test Conditions: 35% RH
22ºC

Measurement Uncertainty: +/-3.7 dB

Receiver Spurious Emissions

Specification Limits:
Limits for radiated disturbance of Class B

Limits for radiated disturbance of Class B

Frequency Range (MHz)	3m Limits (dBuV)	10m Limits (dBuV)
30-88	40	30
88-216	43.5	33.5
216-960	46	36
Above 960	54	44

Method of Measurement (Procedure ANSI C63.4-2003):
Any emissions above 1 GHz were measured with a horn antenna and low noise pre-amplifier at a distance of 3 meters.

Test #: REHE-01

Tested By: Scott Oates

Date of Tests: 4/29/08

Test Conditions:
Test Voltage: 120VAC
Temperature: 22°C
Humidity: 35%

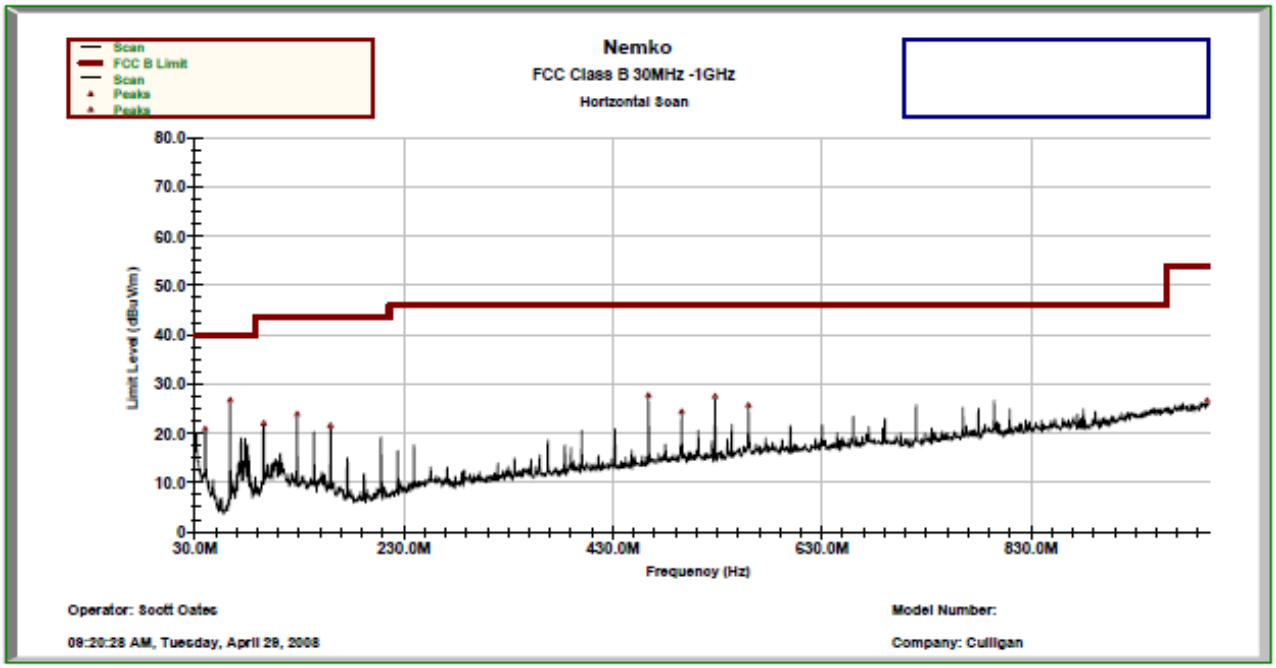
Test Results:
The E.U.T. complies.

TEST EQUIPMENT

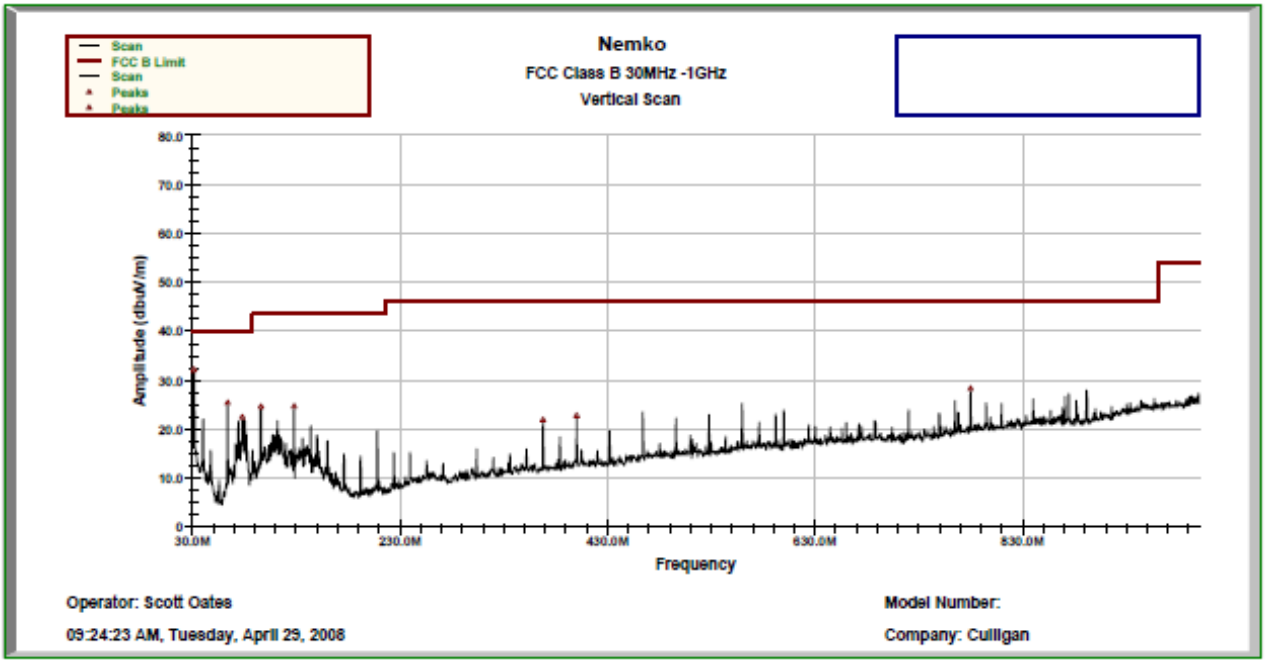
Asset Number	Description	Manufacturer	Model Number	Serial Number	Last Cal	Cal Due
1763	Antenna bilog	Schaffner	CBL6111-D	22926	9/21/07	9/21/08
1762	Cable Assy, 3m Chamber	Nemko	Chamber	N/A	8/15/07	8/15/08
1025	PREAMP, 25dB	Nemko	LNA25	399	12/06/07	12/06/08
1	3m Chamber	Nemko	1	1	8/15/07	8/15/08
1659	Spectrum Analyzer	Rohde & Schwarz	FSP	100037	1/24/07	1/24/09

Test Data –Radiated Emissions, Electric Field, Test# REHE-01

Horizontal



Vertical



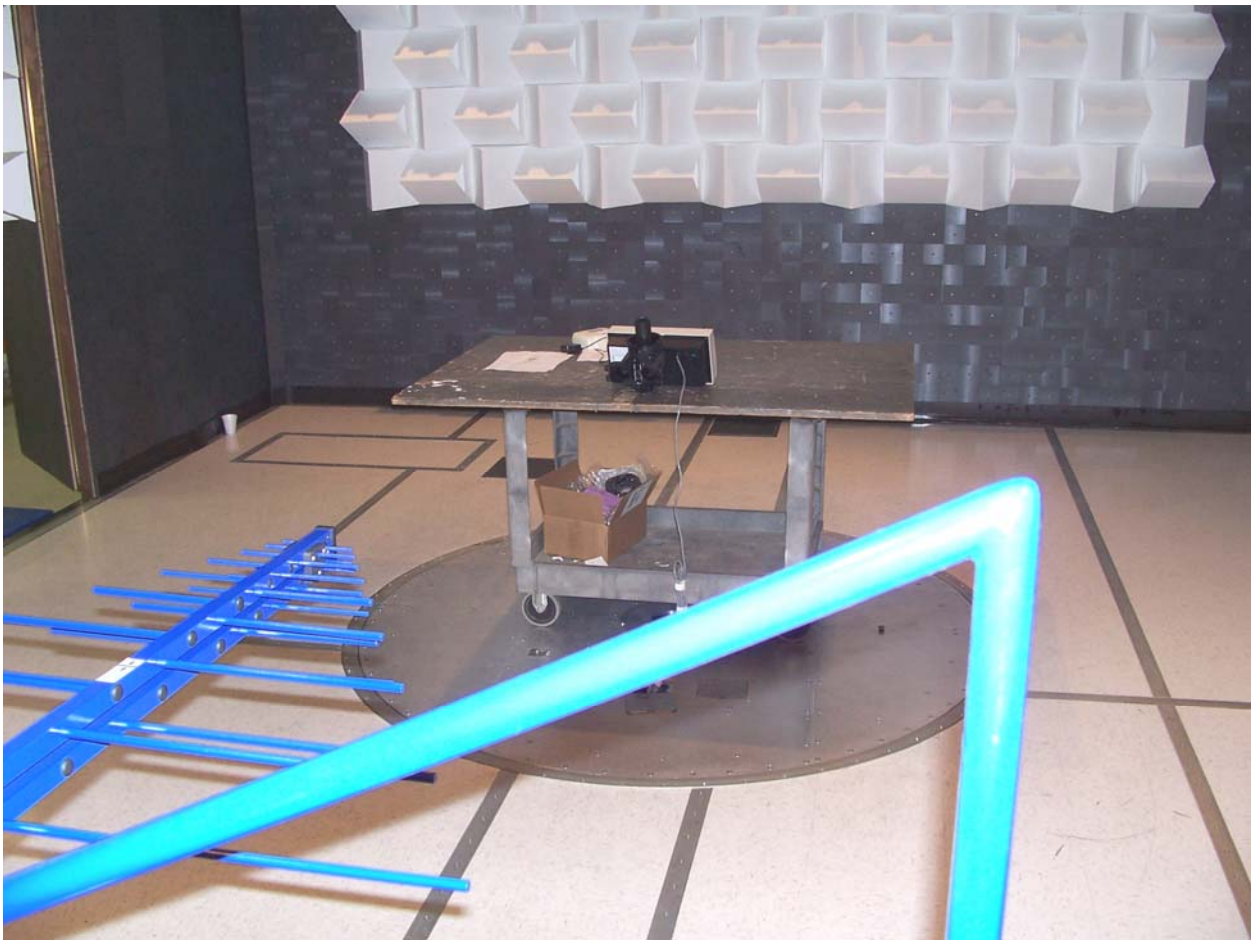
CISPR QPk Results

Frequency	Limit	Horizontal	QP	Vertical	Vertical
MHz	Limit	QP	Margin	QP	Margin
32.0032	40.000			32.313	-7.687
40.48	40.000	17.528	-22.472		
63.9881	40.000	27.638	-12.362	24.699	-15.301
78.1362	40.000			20.701	-19.299
95.9923	43.520	17.726	-25.794	23.488	-20.032
127.996	43.520	22.866	-20.654	23.326	-20.194
160.02	43.520	19.237	-24.283		
367.949	46.020			17.255	-28.765
399.994	46.020			23.024	-22.996
464.015	46.020	23.825	-22.195		
496.025	46.020	16.335	-29.685		
528.036	46.020	16.984	-29.036		
559.986	46.020	24.348	-21.672		
779.953	46.020			21.288	-24.732
998.257	53.980	19.436	-34.544		

NOTE: Emissions were measured up to 5 GHz. No emissions were detected. The ambient noise floor of the measurement setup was less than 30 dBuV/m @ 3m..

IF Bandwidth below 1 GHz: 120 kHz
IF Bandwidth above 1 GHz: 1 MHz
Detector: CISPR Quasi-Peak

Test Setup Photos



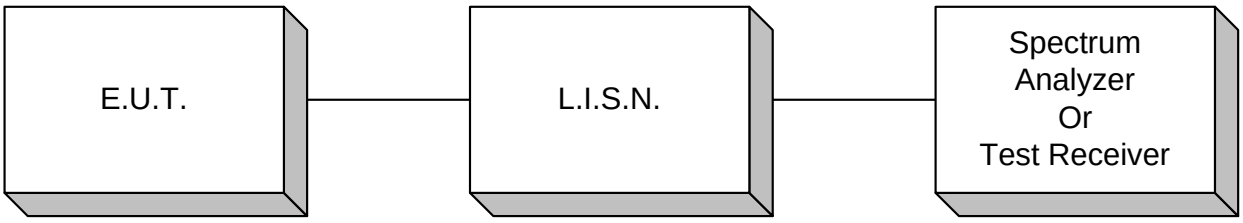
Section 5. Test Equipment List

Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date	Calibration Due
1663	Spectrum Analyzer	Rhode & Schwarz FSP3	100073	07/23/07	07/22/08
1443	Directional coupler	Mini-circuits ZDC-15-6	9010.02	CNR	N/A
1258	LISN .15mhz-30mhz	EMCO 3825/2	1305	06/20/07	06/19/08
572	CABLE, 6.7m	Nemko USA, Inc. RG223	N/A	12/13/07	12/12/08
1548	CABLE .8m	Nemko USA, Inc. RG214	N/A	12/13/07	12/12/08
1562	Attenuator 10db	Midwest Microwave 392-11	NONE	CBU	N/A
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/28/06	07/28/08
1298	CABLE, 1m	HP 0	N/A	CBU	06/15/07
1042	CABLE, 4M	STORM PR90-010-144	N/A	CBU	N/A
1625	CABLE, 18 ft	MEGAPHASE 10311 1GVT4	N/A	CBU	N/A
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/01/07	04/30/08
1763	Bilog Antenna	Schaffner CBL 6111D	22926	09/21/07	09/20/08
1762	Cable	Nemko USA, Inc. none	none	09/19/07	09/19/08
1767	MI Test Receiver 20Hz - 26.5 GHz - 150 - +30 dBm LC	ROHDE & SCHWARZ ESIB26	837491/0002	09/20/07	09/19/08

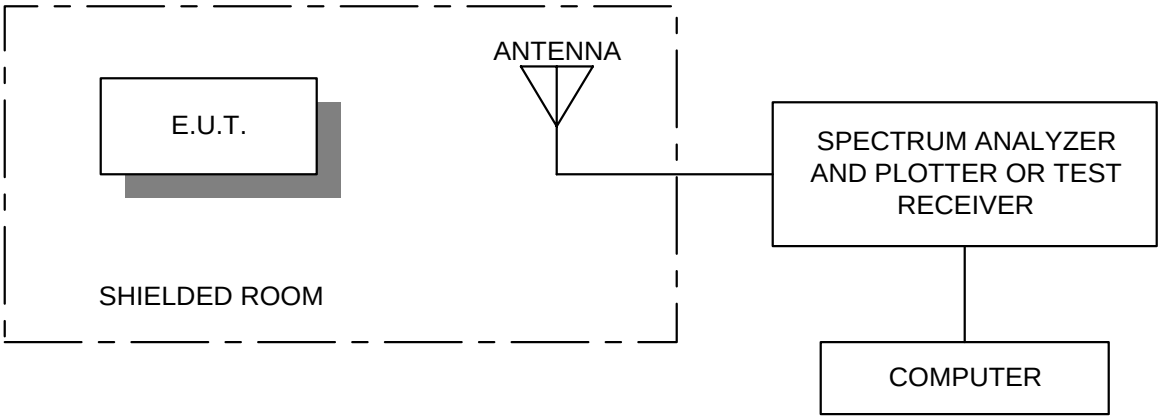
ANNEX A

TEST DIAGRAMS

Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions