STRYKER CORPORATION

13.56MHz RFID short range device

Model Name: CrossFlow
Model Number :0450000000

June 10 2012
Report No.: SL12050701-STR-006 (FCC, IC)

(This report supersedes NONE)

RF Test Report

To: 47 CFR §15.225 :2011, RSS-210 Issue 8 : 2010

SIEMIC, INC.
Accessing global markets

CERTIFICATE OF TEST

Date of Issue : June 10th 2012

Company Name : Stryker Endoscopy Corporation

Product Name/Model : CrossFlow Integrated Arthroscopy Pump/0450000000

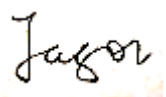
Stipulated Standard :

(1) 47 CFR §15.225: 2011
(2) RSS-210 Issue 8: 2010

Equipment complied with the specification [X]
Equipment did not comply with the specification [ ]

The submission documentation to a National Regulatory Body for type approval purposes shall consist of two parts; Part one : Application Form;
Part two: Test Report;

Modifications made to the product : None

This Test Report is Issued Under the Authority of:	
	
Jason Zhang Compliance Engineer	Leslie Bai Engineering Reviewer

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management through out a project. Our extensive experience with China, Asia Pacific, North America, European, and international compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC , RF/Wireless , Telecom , SAR
Canada	IC, A2LA, NIST	EMC, RF/Wireless , Telecom , SAR
Taiwan	BSMI , NCC , NIST	EMC, RF, Telecom , Safety
Hong Kong	OFTA , NIST	RF/Wireless ,Telecom
Australia	NATA, NIST	EMC, RF, Telecom , Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF , Telecom, Safety , SAR
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC , RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom , Safety, SAR

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC , RF , Telecom
Canada	IC FCB , NIST	EMC , RF , Telecom
Singapore	iDA, NIST	EMC , RF , Telecom
EU	NB	EMC & R&TTE Directive
Japan	MIC, (RCB 208)	RF , Telecom
HongKong	OFTA (US002)	RF , Telecom

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1 Executive Summary & EUT information

The purpose of this test program was to demonstrate compliance of the Stryker Endoscopy Corporation, RFID short range device operating on 13.56 MHz, model: CrossFlow. The CrossFlow have demonstrated compliance with the 47 CFR §15.225: 2011; RSS-210 Issue 8: 2010.

Applicant & EUT Information

Applicant Information

Applicant / Client	Stryker Endoscopy Corporation 5900 Optical Court, San Jose, CA 95138 USA
Manufacturer1	Stryker Endoscopy Corporation 5900 Optical Court, San Jose, CA 95138 USA

EUT Information

EUT Description	:	The Stryker CrossFlow Integrated Arthroscopy Pump is a fluid management system, comprised of a pump console with inflow-only and inflow/outflow modes, disposable cassette tubing, a wired hand control, and a wired footswitch.The system integrates with approved resection consoles. CrossFlow Integrated Arthroscopy Pump - Compatible with the Crossire Console, CrossFlow Footswitch, Autoclavable Hand Control, iSwitch Wireless Universal Foot Control, SDC3 and approved resection consoles
Model Name	:	CrossFlow
Model No	:	0450000000
Serial No	:	DVV2CS10
Input Power	:	100~240 VAC , 50/60Hz,10A
Frequency	:	13.56 MHz
Radiated power	:	50uW
Modulation	:	10% ASK
Sub carrier	:	423.75 kHz, Manchester coding
Classification Per Stipulated Test Standard	:	RFID Reader

2 TECHNICAL DETAILS

Laboratory performing the tests	SIEMIC Laboratories 2206 Ringwood Ave, San Jose, CA 95131
Date of EUT received	May 26th, 2012
Dates of test (from – to)	May 28th – Jun 7th, 2012
Equipment Category	RFID product
Standard applied	See page 2
FCC ID:	SSH-XFLOW
IC ID:	4919C-XFLOW

EUT Test Mode Evaluation

EUT Major Function List

Functions	Description
Fn#1	N/A

EUT Test Mode List

RF Test Modes	Description	Test Configuration
RF_Test Mode	EUT continuous transmit itself when power on	Continuous TX

Supporting Equipment & Cabling

Supporting equipment used with the EUT

Equipment Description	Model	Serial No.	Manufacturer
N/A	N/A	N/A	N/A

Details of cables between EUT and Supporting Equipment

Connection Start		Connection Stop		Length / shielding Info	
From	I/O Port	To	I/O Port	Length(m)	Shielding
N/A	N/A	N/A	N/A	N/A	N/A

Test Software Information

Test Item	Software	Description
Radiated & conducted Testing	N/A	EUT continuous transmit itself when power on

3 MODIFICATION

Report No.	Report Version	Description	Issue Date

4 TEST SUMMARY

The product was tested in accordance with the following specifications.

All Testing has been performed according to below product classification:

RFID short range device

Test Results Summary

Test Standard		Description	Pass / Fail
47 CFR Part 15.225: 2011	RSS 210 Issue 8: 2010		
15.203		Antenna Requirement	Pass
15.207(a)	RSS Gen(7.2.2)	Conducted Emissions Voltage	Pass
15.225(a)	RSS210(A2.6)	Limit in the band of 13.553 – 13.567 MHz	Pass
15.225(b)	RSS210(A2.6)	Limit in the band of 13.410 – 13.553 MHz and 13.567 – 13.710 MHz	Pass
15.225(c)	RSS210(A2.6)	Limit in the band of 13.110 – 13.410 MHz and 13.710 – 14.010 MHz	Pass
15.225(d), 15.209	RSS210(A2.6)	Limit outside the band of 13.110 – 14.010 MHz	Pass
15.225(e)	RSS210(A2.6)	Frequency Stability	Pass
	RSS-210(5.9.1)	Occupied Bandwidth	Pass
ANSI C63.4: 2009/ RSS-Gen Issue 3: 2010 PS: All measurement uncertainties are not taken into consideration for all presented test result.			

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 Antenna Requirement

Requirement(s): 47 CFR §15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna requirement must meet at least one of the following:

a) Antenna must be permanently attached to the device.
b) Antenna must use a unique type of connector to attach to the device.
Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

The RFID antenna is integral to the main board permanently to the device which meets the requirement (See Internal Photographs submitted as another Exhibit).

Results: Pass

5.2 AC Line Conducted Emission Test Result

Note:

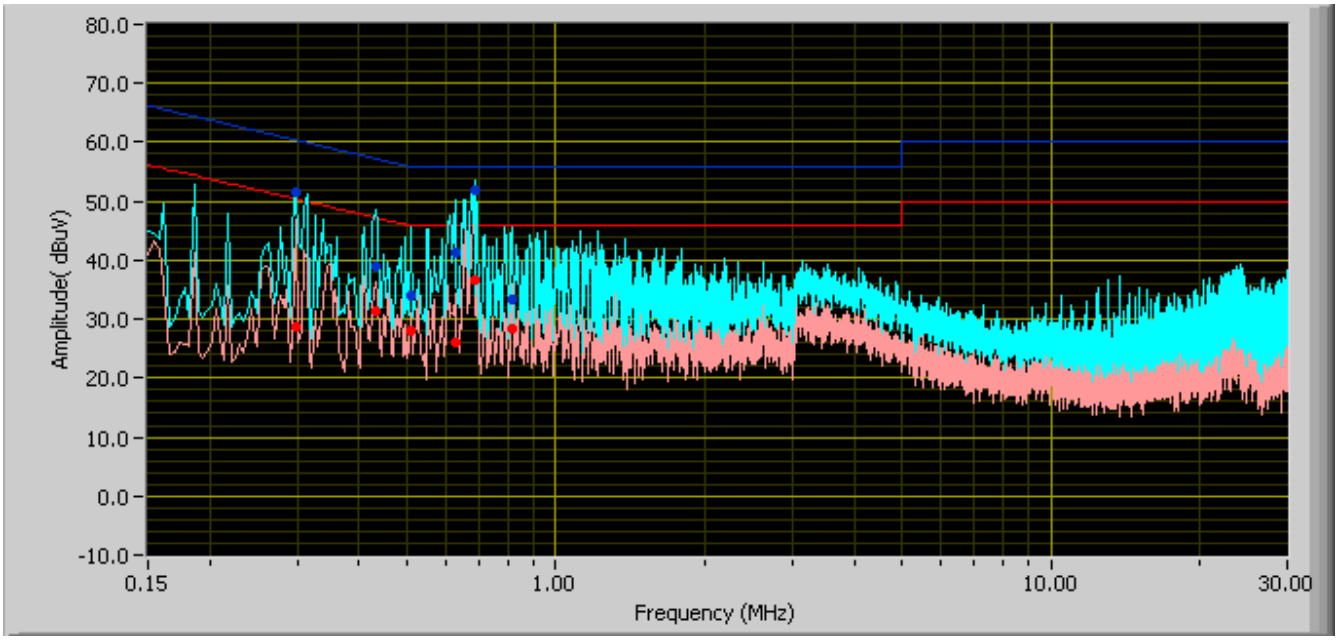
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is ±3.86dB.
4. Environmental Conditions

	Temperature	25ºC
	Relative Humidity	50%
	Atmospheric Pressure	1019mbar

Test Date : May 28th – Jun 7th, 2012
Tested By : Jason Zhang

Results: PASS

Test Result

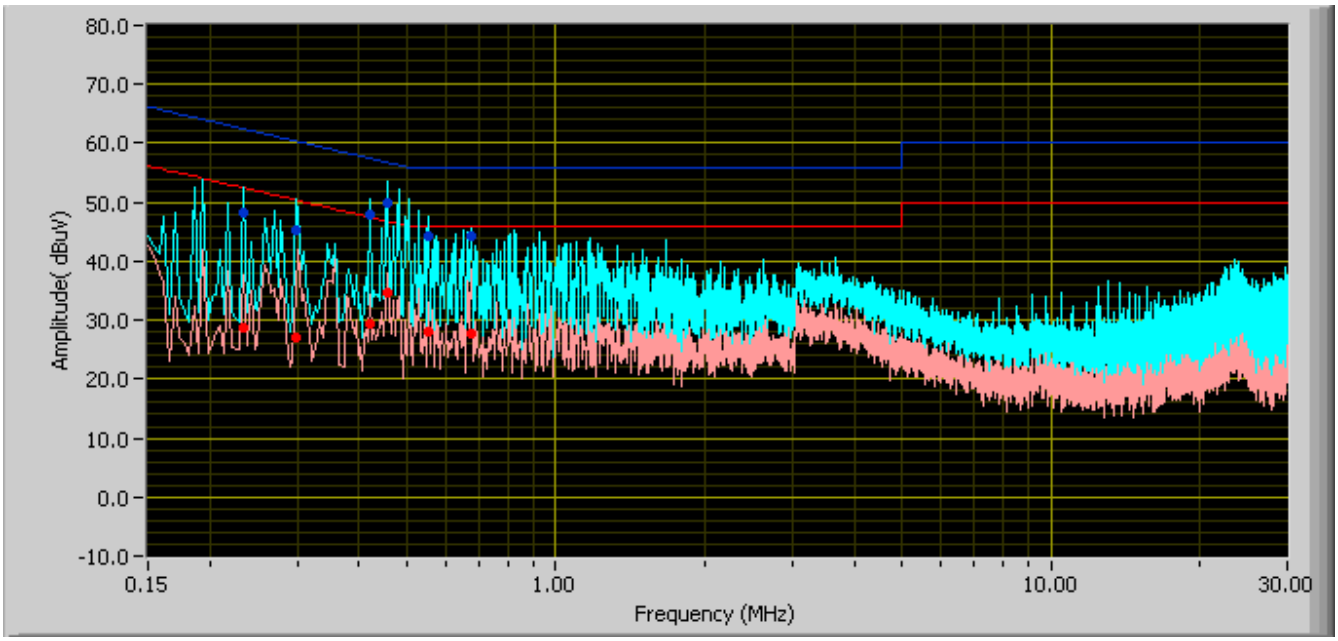


Quasi-Peak Limit

Average Limit

120V, 60Hz, Neutral Line

Frequency (MHz)	QP Value (dBµV)	Class B Limit (dB)	Pass / Fail	Margin (dB)	Avg Value (dBµV)	Class B Limit (dBuV)	Pass / Fail	Margin (dB)	Line
0.30	51.55	60.38	Pass	-8.82	28.56	50.38	Pass	-21.82	Neutral
0.43	39.04	57.19	Pass	-18.15	31.52	47.19	Pass	-15.67	Neutral
0.51	34.07	56.00	Pass	-21.93	27.93	46.00	Pass	-18.07	Neutral
0.63	41.43	56.00	Pass	-14.57	25.93	46.00	Pass	-20.07	Neutral
0.69	51.74	56.00	Pass	-4.26	36.69	46.00	Pass	-9.31	Neutral
0.82	33.33	56.00	Pass	-22.67	28.30	46.00	Pass	-17.70	Neutral



Quasi-Peak Limit

Average Limit

120V, 60Hz, Phase Line

Frequency (MHz)	QP Value (dBμV)	Class B Limit (dB)	Pass / Fail	Margin (dB)	Avg Value (dBμV)	Class B Limit (dBuV)	Pass / Fail	Margin (dB)	Line
0.23	48.29	62.42	Pass	-14.14	28.59	52.42	Pass	-23.83	Phase
0.30	45.36	60.38	Pass	-15.02	27.06	50.38	Pass	-23.32	Phase
0.42	48.03	57.43	Pass	-9.41	29.45	47.43	Pass	-17.98	Phase
0.46	49.74	56.74	Pass	-7.00	34.56	46.74	Pass	-12.18	Phase
0.55	44.18	56.00	Pass	-11.82	27.98	46.00	Pass	-18.02	Phase
0.67	44.38	56.00	Pass	-11.62	27.67	46.00	Pass	-18.33	Phase

5.3 Radiated Spurious Emission > 30 MHz (30MHz – 1 GHz, E-Field)

Note:

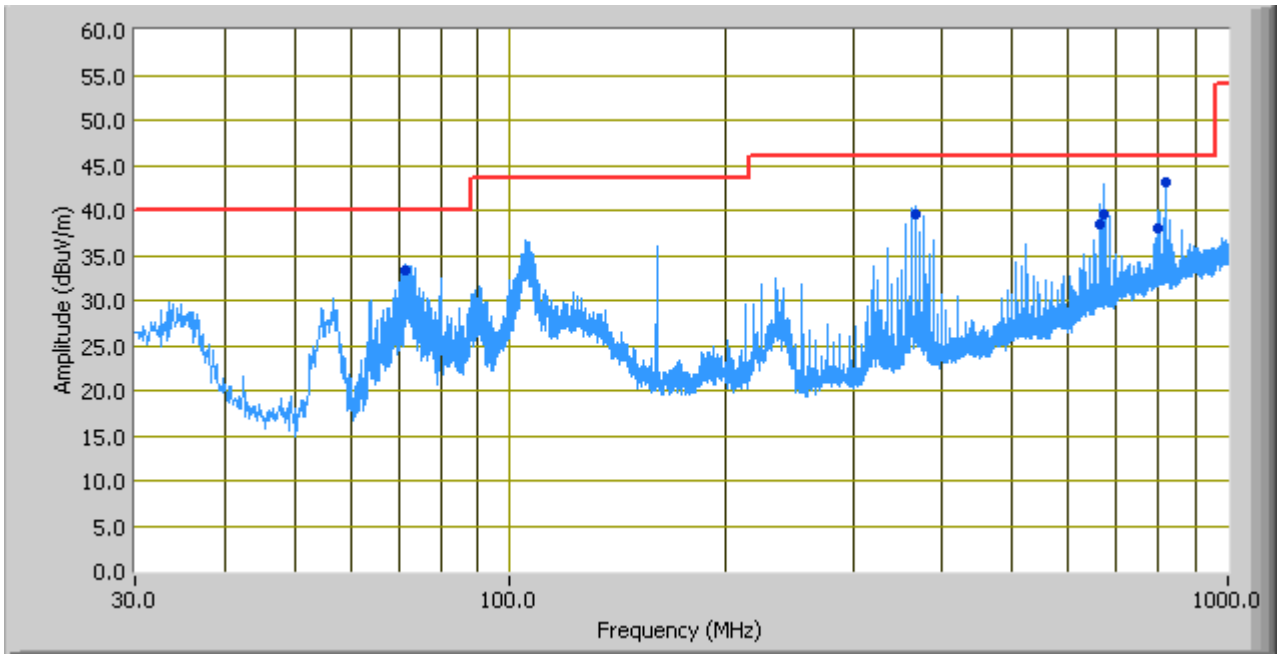
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (QP only @ 3m & 10m) is +5.6dB/-4.5dB (for EUTs < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

Temperature	21.8°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : May 28th – Jun 7th, 2012
Tested By : Jason Zhang

Results: PASS

Test Result



Limit

30MHz ~1000MHz

Frequency	Corrected Amplitude	Turntable position	Polarity	Antenna height	Class B Limit	Margin	Measure Detector
(MHz)	dBuV/m	(deg)		(cm)	(dBμV/m)	(dB)	
71.23	33.40	344.00	V	182.00	40.00	-6.60	QP
367.09	39.52	332.00	H	211.00	43.50	-6.48	QP
665.01	38.45	357.00	H	107.00	43.50	-7.55	QP
670.33	39.64	359.00	H	113.00	43.50	-6.36	QP
798.02	38.04	342.00	V	111.00	43.50	-7.96	QP
819.26	43.00	23.00	V	111.00	46.00	-3.00	QP

5.4 Radiated Emission < 30MHz (9kHz - 30MHz, H-Field)

Requirement(s): 47 CFR §15.225

Procedures: For < 30MHz, Radiated emissions were measured according to ANSI C63.4. The EUT was set to transmit at the highest output power. The EUT was set 10 meter away from the measuring antenna. The loop antenna was positioned 1 meter above the ground from the centre of the loop. The measuring bandwidth was set to 10 kHz. (Note: During testing the receive antenna was rotated about its axis to maximize the emission from the EUT.)

The limit is converted from microvolt/meter to decibel microvolt/meter.

Sample Calculation: Corrected Amplitude = Raw Amplitude (dBμV/m) + ACF (dB) + Cable Loss (dB) – Distance Correction Factor

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/- 6dB.
4. Environmental Conditions

	Temperature	23°C
	Relative Humidity	48%
	Atmospheric Pressure	1019mbar

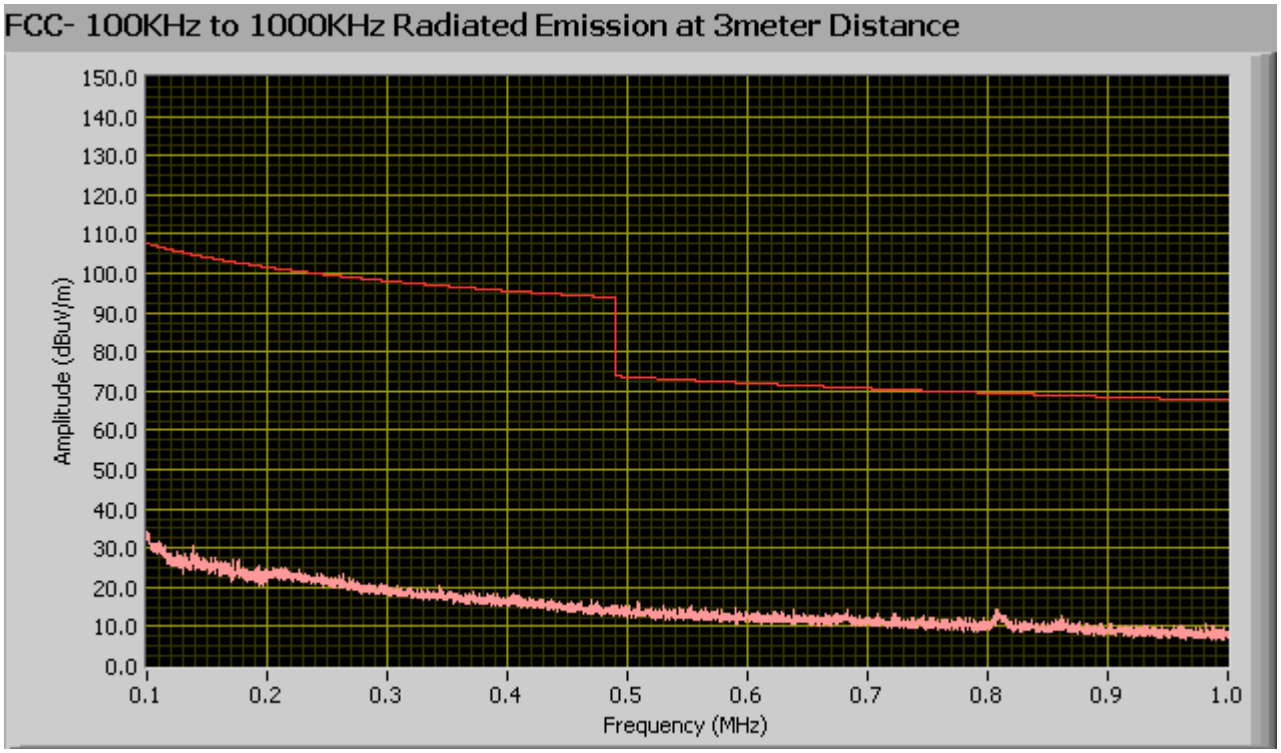
Test Date : May 28th – Jun 7th, 2012
Tested By : Jason Zhang

Results: Pass

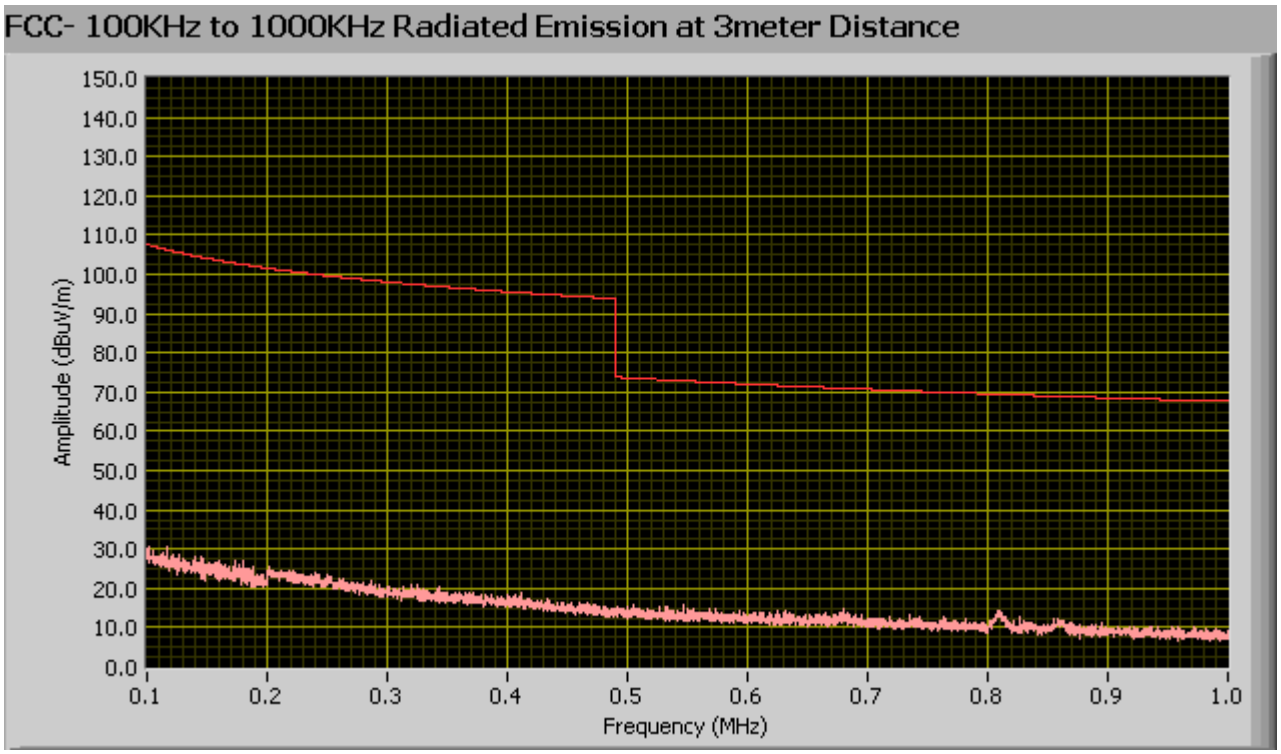
100 kHz ~ 1 MHz

General Emission Limit @ 3 Meter

Loop Antenna at 0 degree



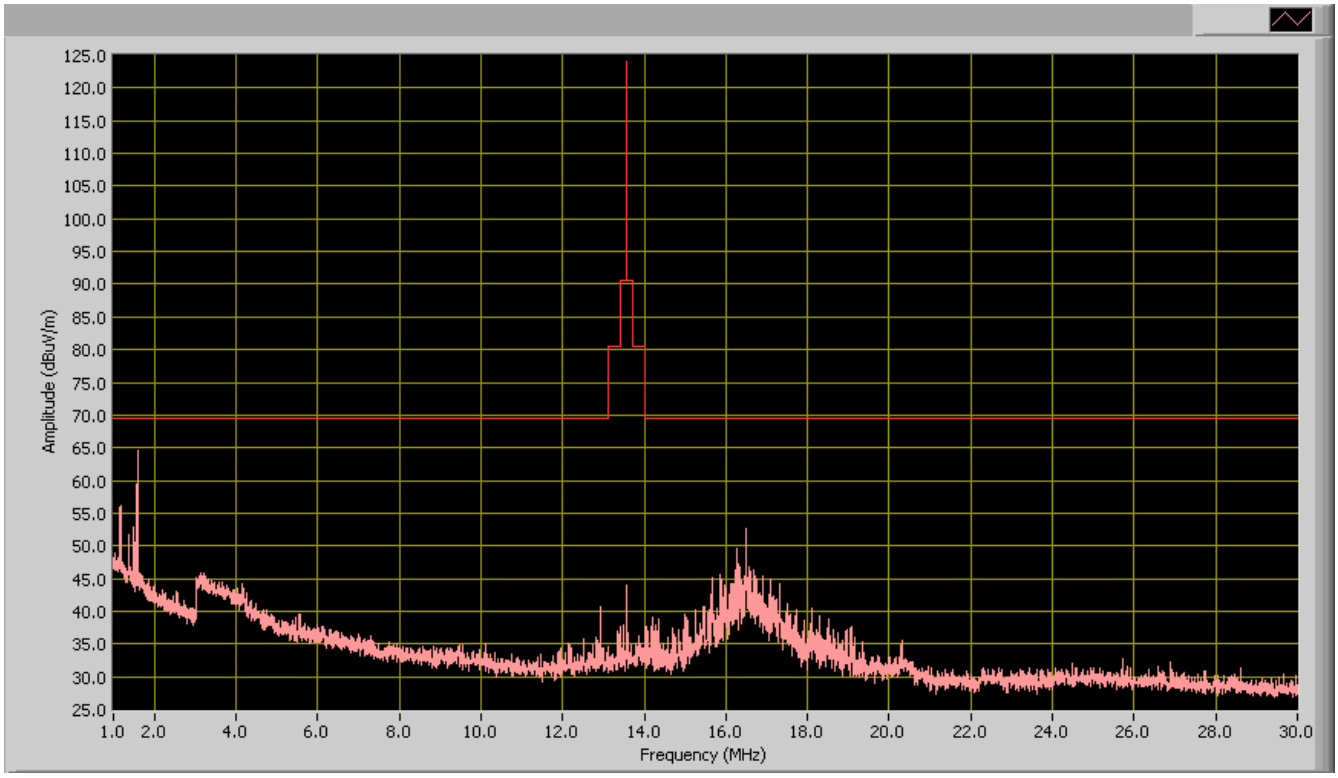
Loop Antenna at 90 degree



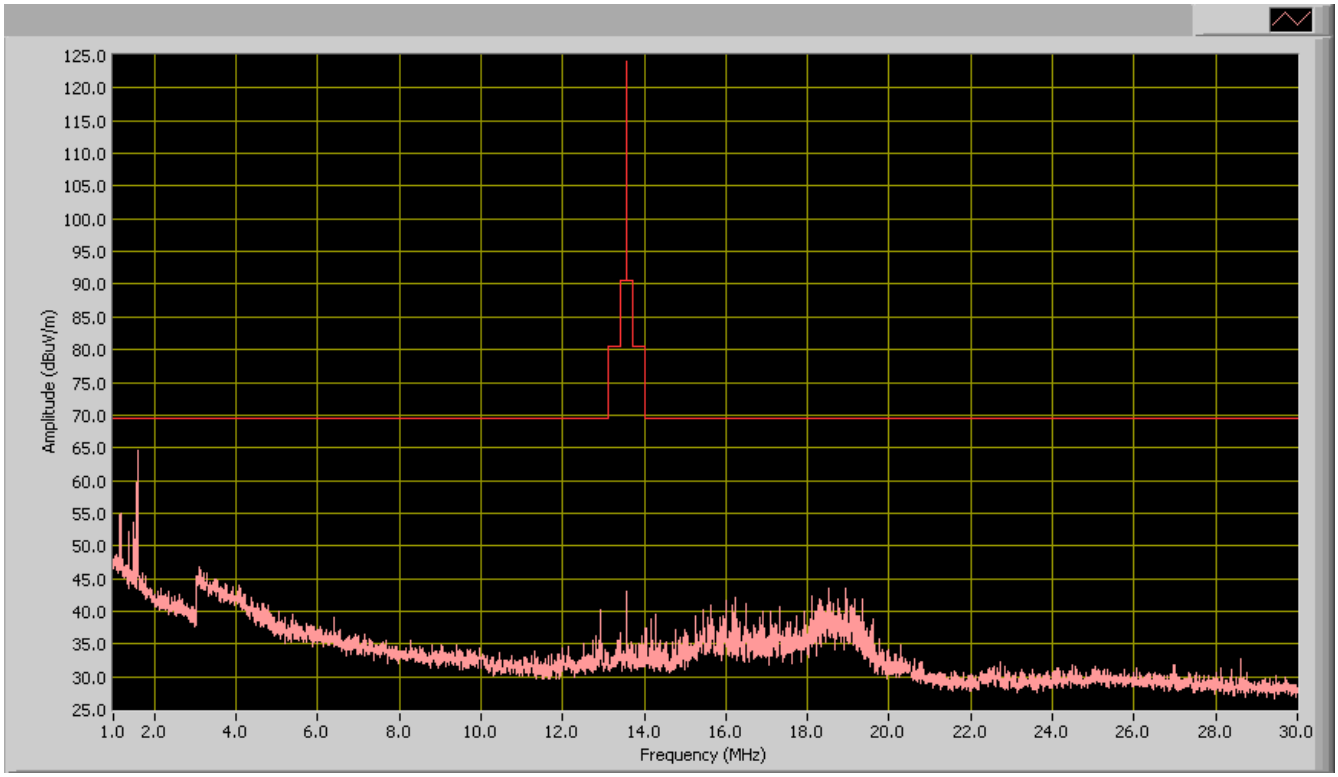
1MHz ~ 30MHz

Loop Antenna at 0 degree

General Emission Limit @ 3 meter



Loop Antenna at 90 degree



5.5 Fundamental Field Strength Test Result

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/- 6dB.
4. Environmental Conditions

	Temperature	23°C
	Relative Humidity	50%
	Atmospheric Pressure	1019mbar

Test Date : May 28th – Jun 7th, 2012
Tested By : Jason Zhang

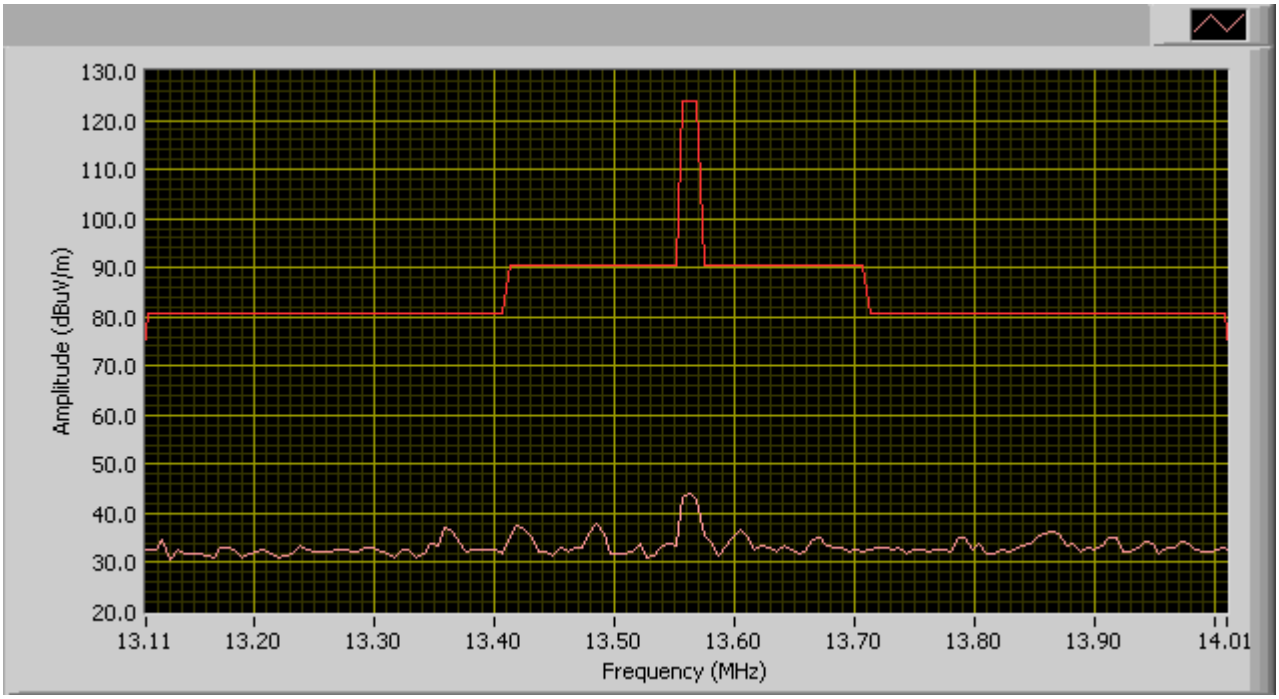
Test Requirement:

13.56 MHz ---The field strength of any emissions within allowed operating band shall not exceed 10mV/m at 30 meters.

Test Plot

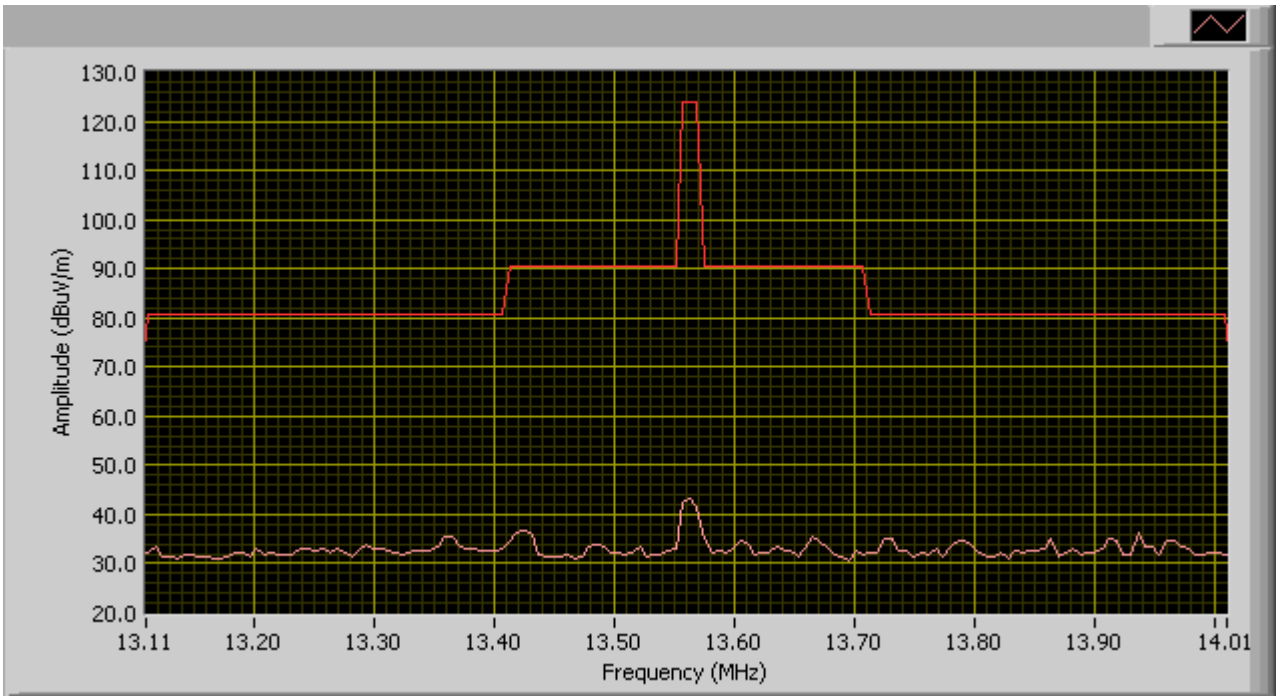
Loop Antenna at 0 degree

General Emission Limit @ 3 meter



Frequency(MHz)	Amplitude(dBuV/m)
13.563	43.93

Loop Antenna at 90 degree



Frequency(MHz)	Amplitude(dBuV/m)
13.563	43.02

5.6 Frequency Stability

Requirement(s): 47 CFR §15.225(e)

Procedures: Frequency Stability was measured according to 47 CFR §2.1055. Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz. A voltmeter was used to monitor when varying the voltage.

Limit: ±0.01% of 13.56 MHz = 1356 Hz

Environmental Conditions	Temperature	23°C
	Relative Humidity	48%
	Atmospheric Pressure	1019mbar

Test Date : May 28th – Jun 7th, 2012
Tested By : Jason Zhang

Results: Pass

Test Result

Frequency Stability versus Temperature: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01% of the operating frequency over a temperature variation of -20ºC to +50ºC at normal supply voltage.

Reference Frequency: 13.560571 MHz at -20°C and +50ºC

Temperature (ºC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
50	13.560573	2	<0.01	Pass
40	13.560577	6	<0.01	Pass
30	13.560582	11	<0.01	Pass
20	Reference (13.560571 MHz)			
10	13.560572	1	<0.01	Pass
0	13.560569	2	<0.01	Pass
-10	13.560565	6	<0.01	Pass
-20	13.560566	5	<0.01	Pass

Frequency Stability versus Input Voltage: The Frequency tolerance of the carrier signal shall be maintained within ± 0.01%, the frequency of the transmitter was measured at 85% and at 115% of the rated power supply voltage at 20ºC environmental temperature.

Carrier Frequency: 13.560571 MHz at 20°C at 120VAC

Measured Voltage ±15% of nominal (AC)	Measured Freq. (MHz)	Freq. Drift (Hz)	Freq. Deviation (Limit: 0.01%)	Pass/Fail
102	13.560580	9	<0.01	Pass
138	13.560586	15	<0.01	Pass

5.7 Occupied Bandwidth

Requirement(s): RSS-210 (5.9.1)

Procedures: Occupied Bandwidth was measured according to RSS-210 (5.9.1). Measurement was taken with spectrum analyzer. The spectrum analyzer bandwidth and span was set to read in hertz.

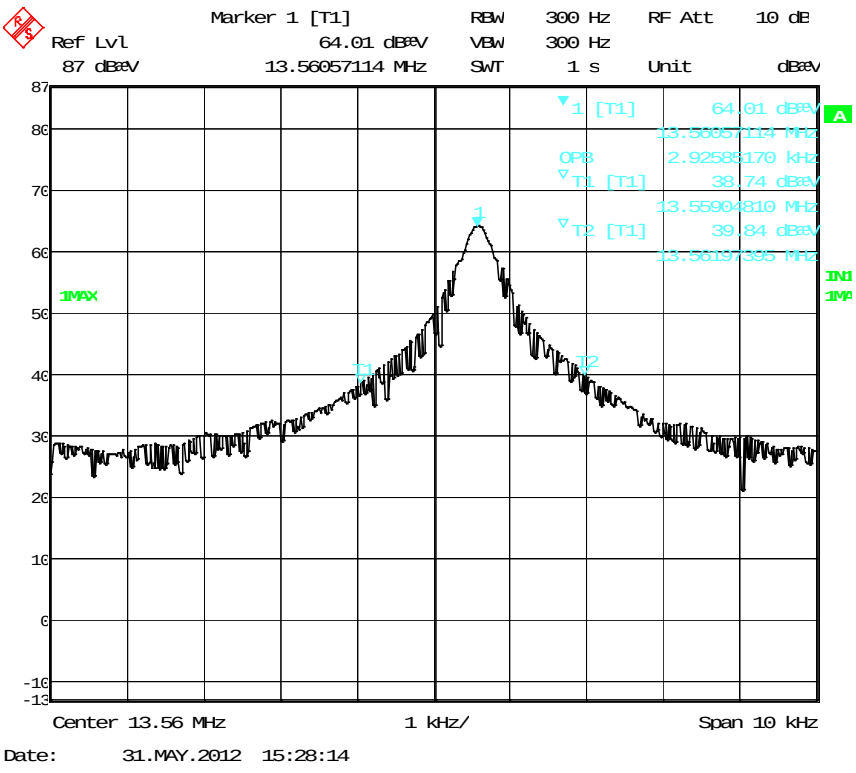
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, is +/- 6dB.
4. Environmental Conditions

Temperature	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : May 28th – Jun 7th, 2012
Tested By : Jason Zhang

Results: Pass

Test Result



Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Model	Serial #	Calibration Date	Calibration Due	Calibrate Cycle
CONDUCTED EMISSIONS					
R & S Receiver	ESIB 40	100179	04/20/2012	04/20/2013	1year
R&S LISN	ESH2-Z5	861741/013	05/18/2012	05/18/2013	1year
CHASE LISN	MN2050B	1018	05/18/2012	05/18/2013	1year
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2012	05/25/2013	1year
Radiated Emissions					
R & S Receiver	ESIB 40	100179	04/20/2012	04/20/2013	1year
Sunol Sciences, Inc. antenna (30MHz~2GHz)	JB1	A030702	02/09/2012	02/09/2013	1year
3 Meters SAC	3M	N/A	10/13/2011	10/13/2012	1year
10 Meters OATS	10M	N/A	06/17/2011	06/17/2012	1year
Sekonic Hygro Hermograph	ST-50	HE01-000092	05/25/2012	05/25/2013	1year
Test Equity Environment Chamber	1007H	61201	06/01/2012	06/01/2013	1year
Passive Loop Antenna (10kHz-30MHz)	6512	49120	05/22/2012	05/22/2013	1year

Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

Test Set-up

The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.

The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.

The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.

All other supporting equipments were powered separately from another main supply.

Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.
3. High peaks, relative to the limit line, were then selected.
4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 KHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.
5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Sample Calculation Example

At 20 MHz limit = 250 μV = 47.96 dBμV

Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB

Q-P reading obtained directly from EMI Receiver = 40.00 dBμV
(Calibrated for system losses)

Therefore, Q-P margin = 47.96 – 40.00 = 7.96 i.e. 7.96 dB below limit

Annex A. iii RADIATED EMISSIONS TEST DESCRIPTION

EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 1GHz (for FCC tests, until the 5th harmonic for operating frequencies ≥ 108MHz), was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred; clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS).

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table as shown in Annex B.

2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.

3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.

2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:

   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.

3. A Quasi-peak measurement was then made for that frequency point.

4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.

5. The frequency range covered was from 30MHz to 1GHz (for FCC tests, until the 5th harmonic for operating frequencies ≥ 108MHz), using the Biconical antenna for frequencies from 30MHz to 230MHz, Log-periodical antenna for frequencies from 230MHz to 1GHz, and the Horn antenna above 1GHz.

Sample Calculation Example

At 300 MHz limit = 200 μV/m = 46.00 dBμV/m

Log-periodic antenna factor & cable loss at 300 MHz = 18.50 dB

Q-P reading obtained directly from EMI Receiver = 40.00 dBμV/m
(Calibrated level including antenna factors & cable losses)

Therefore, Q-P margin = 46.00 – 40.00 = 6.00 i.e. 6 dB below limit

Annex B EUT PHOTOGRAPHS

Annex B.i. Photograph 1: EUT External Photo

Please see attachment

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

TEST SETUP

Please see attachment

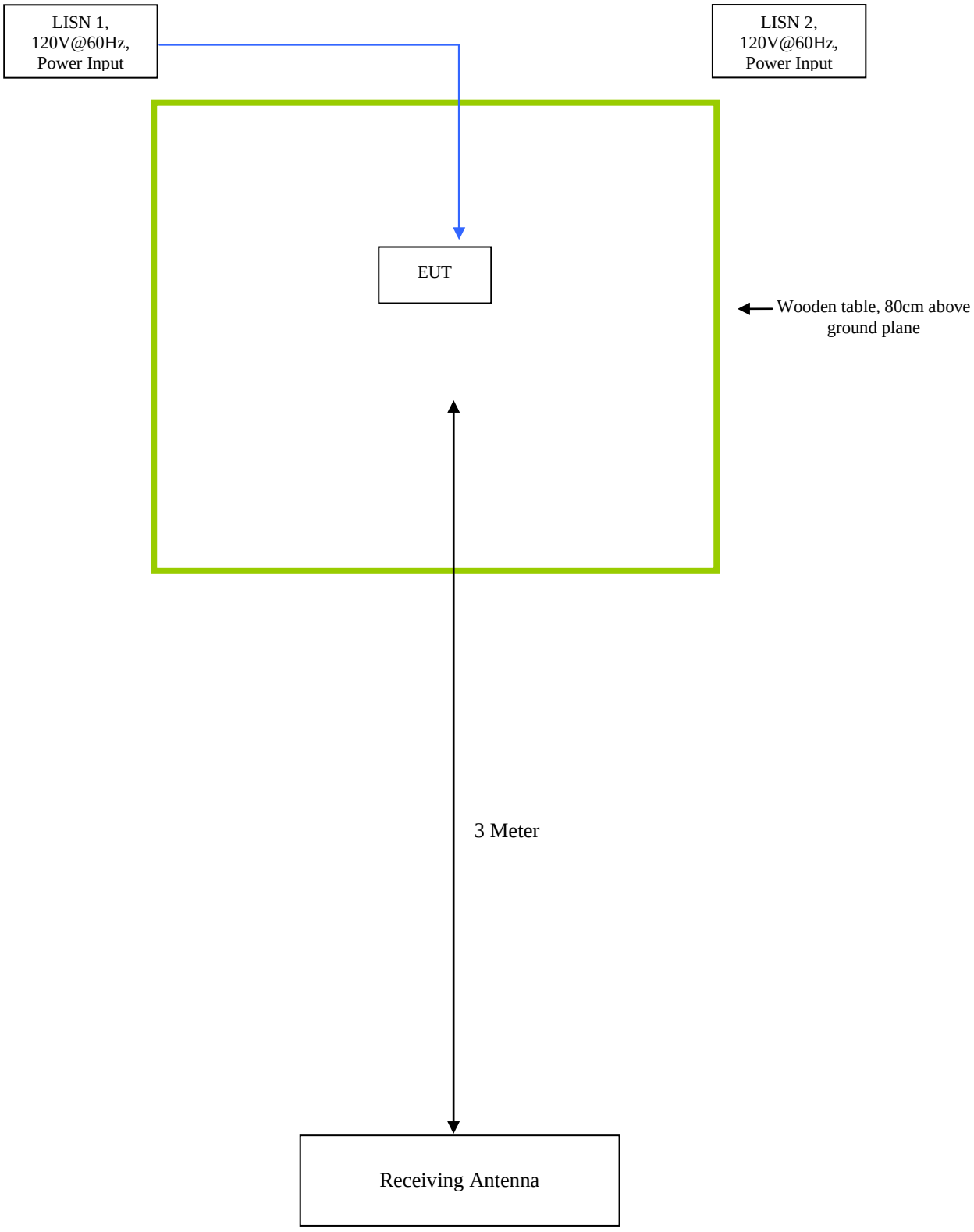
TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

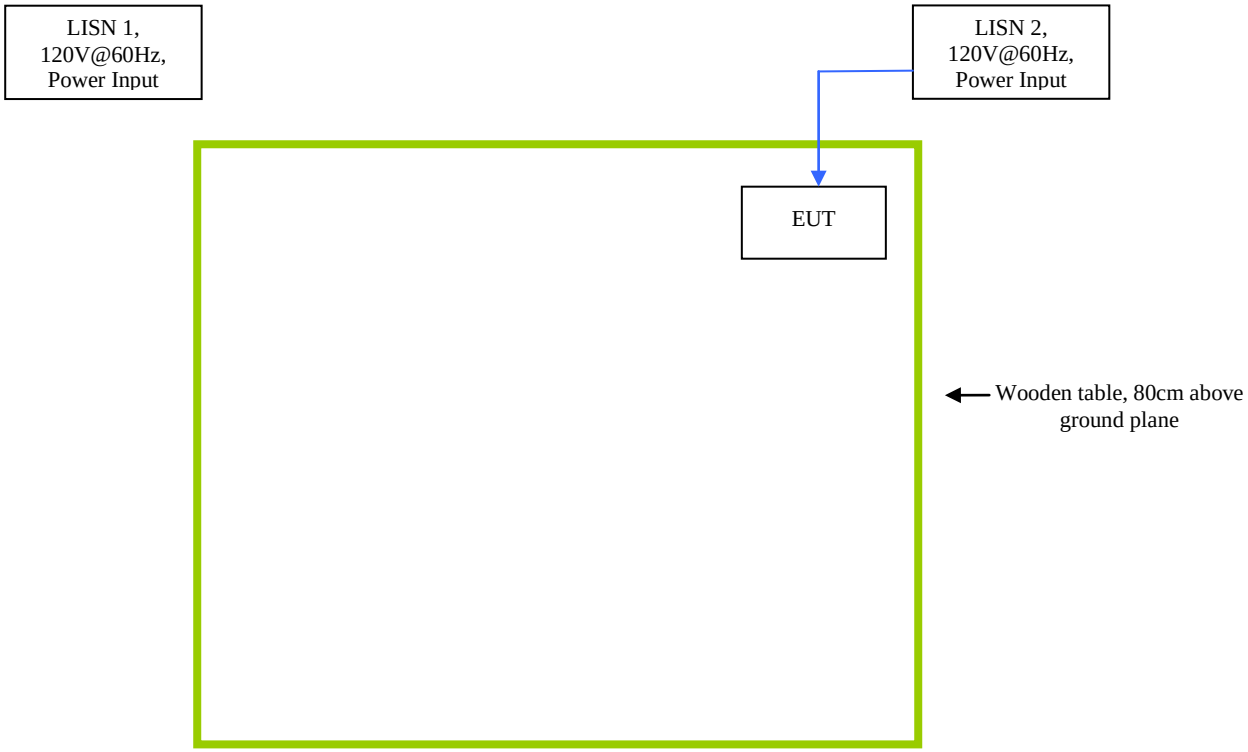
The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)

Block Configuration Diagram for Radiated Emission



Block Configuration Diagram for Conducted Emission



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	The EUT was continuously transmitting itself when power on.
Others Testing	The EUT was continuously transmitting itself when power on.

Annex D USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment