美敦力醫療產品股份有限公司

CARELINK HOME MONITOR (WITH ANALOG MODEM & 150KHZ - 200KHZ AND 402MHZ MICS)

MODEL: 2490C

Issued Date: April 12th 2012
Report No.: SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.5
(This report supersedes SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.4

RF Test Report
To: LP0002: 2011
SIEMIC, INC.
Accessing global markets

Modifications made to the product : None

This Test Report is Issued Under the Authority of:	
Dan Coronia Compliance Engineer	Leslie Bai Director of Certification

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Test result presented in this test report is applicable to the representative sample only.

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.

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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 CARELINK HOME MONITOR (WITH ANALOG MODEM & 150KHZ - 200KHZ AND 402MHZ MICS), model: 2490C, against the current Stipulated Standards. The 2490C have demonstrated compliance with the LP0002: 2011.

The test has demonstrated that this unit complies with stipulated standards.

Applicant & EUT Information

Applicant Information

Applicant / Client	**美敦力醫療產品股份有限公司 臺北市中山區建國北路 2 段 120 號 13 樓**
Manufacturer	**Medtronic, Inc. 8200 Coral Sea Street N.E. ,Mounds View, MN 55112 USA**

EUT Information

General Info	
EUT	**CARELINK HOME MONITOR (WITH ANALOG MODEM & 150KHZ - 200KHZ AND 402MHZ MICS)**
Trade Name	**Medtronic**
Model No.	**2490C**
No of Units:	**# 2**
Input Power	**100-240 VAC, 50/60Hz ,0.5A (Power adapter input)\ 7VDC (Power adapter output)**
Port/Connectors	**RJ11**
Technical Detail	
Classification Per Stipulated Test Standard	**Low Power Radio Device**
TX Output power	**-16.04 dBuV/m @ 200KHz @300m* 56.30 dBuV/m @ 402.15MHz @3m**
RF Operating Frequency (ies) /Modulation(s)	**150KHz, 200KHz (FSK, 2CH) 402-405MHz (FSK, 10CH)**
Clock/Oscillator Frequency (ies)	**Unidentified**
FCC ID	**N/A**

EUT operating description

The Medtronic CARELINK HOME MONITOR (WITH ANALOG MODEM & 150KHZ - 200KHZ AND 402MHZ MICS) is designed to automatically gather information from implanted heart device and send it to clinics. Sending heart device information to your clinic using wireless technology does not require interactions with monitor. This process is silent and invisible. This automatic wireless communication between the heart device and the monitor takes place at times scheduled by the doctor or clinic. The heart device information is sent over a telephone line.

CARELINK HOME MONITOR (WITH ANALOG MODEM & 150KHZ - 200KHZ AND 402MHZ MICS) contains two radios inside, 150KHz – 200KHz radio and 402MHz radio. Both of them are enabled. Carelink Home Monitor won't work at them simultaneously, but will chose automatically to transmit at either frequency band based on the implant type nearby.

EUT Operating Frequencies/Channels List

150 KHz – 200 KHz frequency band

Channel Number	Frequency (KHz)	Channel Number	Frequency (KHz)
1	150	2	200

402MHz frequency band

Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
1	402.15	6	403.65
2	402.45	7	403.95
3	402.75	8	404.25
4	403.05	9	404.55
5	403.35	10	404.85

Note: 2490C can work with both 150-200KHz and 402MHz band (Both bands won't work at the same time, but will chose automatically to transmit at either frequency band based on the implant type nearby. Both radios are installed inside 2490C and they're enabled already. Testing was performed on 2 different samples, while one sample transmits at 150 KHz – 200 KHz, and another one transmits at 402MHz band.

Testing and evaluation for CARELINK HOME MONITOR (WITH ANALOG MODEM & 150KHZ - 200KHZ AND 402MHZ MICS) was done with 2 samples working at different bands. Current report contains test result and data for 402MHz band only. Please refer to different test report for result and data for 150 KHz – 200 KHz band.

Familly Model Difference Comparison Table

N/A

2 TECHNICAL DETAILS

Laboratory performing the tests	**SIEMIC Laboratories**
Date of EUT received	**Nov 1st 2011**
Dates of test (from – to)	**Nov 10th - Nov 15th 2011**
Equipment Category:	**Low Power Radio-frequency Devices**
Standard applied	**See page 2**

EUT Test Mode Evaluation

EUT Major Function List

Functions	Description
Fn#1	Communicate with implanted heart device using TEL B RF signal, gather information and send to clinic over a telephone line; EUT works between 402-405MHz frequency ranges with 10 channels.
Fn#2	N/A

Note: In this test report, we only evaluate EUT working at 402MHz frequency band.

EUT Test Mode List

Test Modes	Description	Test Configuration
TM#1	TEL B (Low channels,CH1; FSK modulation)	Continuous TX modulated, with AC/DC adapter
TM#2	TEL B (Mid channels,CH7; FSK modulation)	Continuous TX modulated, with AC/DC adapter
TM#3	TEL B (Mid channels,CH10; FSK modulation)	Continuous TX modulated, with AC/DC adapter
Summary	N/A	

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
N/A	N/A	N/A	N/A	N/A	N/A

Test Software Information

Test Item	Test Software	Description
Radiated Testing	Internal Software	EUT was controlled by internal test command provided by manufacturer
N/A	N/A	N/A

3 MODIFICATION

Report No.	Report Version	Description	Issue Date
SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.0	Rev3.0	Update applicant name and address	03/04/2012
SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.1	Rev3.1	Update applicant name and address	03/15/2012
SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.2	Rev3.2	Update EUT info description	03/21/2012
SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.3	Rev3.3	Correct EUT name	03/22/2012
SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.4	Rev3.4	Correct test distance, equipment list, calibration date	04/12/2012
SL11080502-MED-0011(LP0002)_RF(2490C_402MHz) Rev3.5	Rev3.5	Revised Calibration dated	04/16/2012

4 TEST SUMMARY

The product was tested in accordance with the following specifications. All testing has been performed according to below product classification:

Low Power Radio Device

Test Results Summary

Emissions			
Test Standard	**Description**	**Product Class**	**Pass / Fail**
LP0002: 2011 §4.11.3(1)	EIRP / RF power	See Above	Pass
LP0002: 2011 §4.11.3(2)	Occupied Bandwidth	See Above	Pass
LP0002: 2011 §4.11.3(3)	Unwanted Spurious emission	See Above	Pass
LP0002: 2011 §4.11.3(4)	Frequency Error	See Above	Pass
LP0002: 2011 §4.11.5	Frequency Monitoring (LBT measurement)	See Above	Pass
LP0002: 2011 §2.3	AC Line Conducted Emissions	See Above	Pass
LP0002: 2011 §2.2	Antenna Requirement	See Above	Pass

The test has demonstrated that this unit complies with stipulated standards.

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 FCC 15.225 2009 §2.2 Antenna Requirement

Requirement(s):

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.

c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

Evaluation Summary:
The antenna is permanently attached to the PCB.

Results: Pass

5.2 FCC 15.225 2009 §2.3 Conducted Emissions Voltage

Standard Requirement: FCC 15.225 2009, §2.3

For Low-power radio-frequency devices 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 [mu]H/50 ohms line impedance stabilization network (LISN). The lower limitapplies at the boundary between the frequency ranges.

Standard Requirement:

Frequency of emission (MHz)	Conducted limit (dBµV)	
	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.

Note:

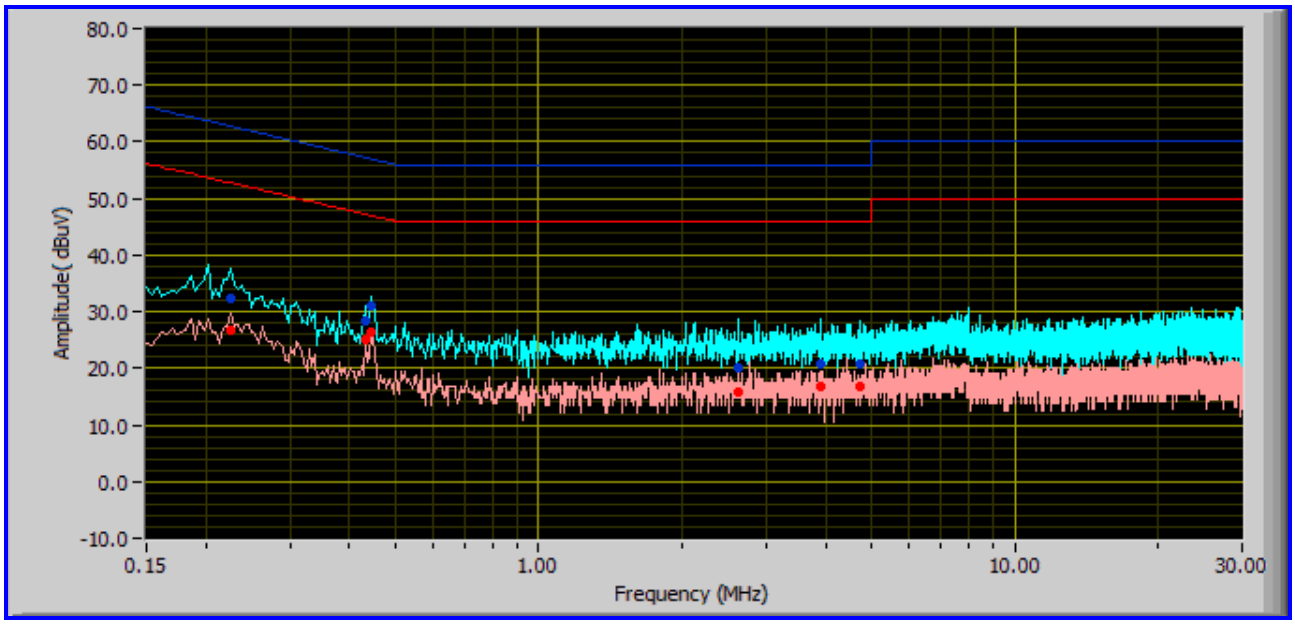
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at 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 150kHz – 30MHz (Average & Quasi-peak) is ±3.5dB.
4. Environmental Conditions

Temperature	25ºC
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : November 10-15 2011
Tested By : Dan Coronia

Results: Pass

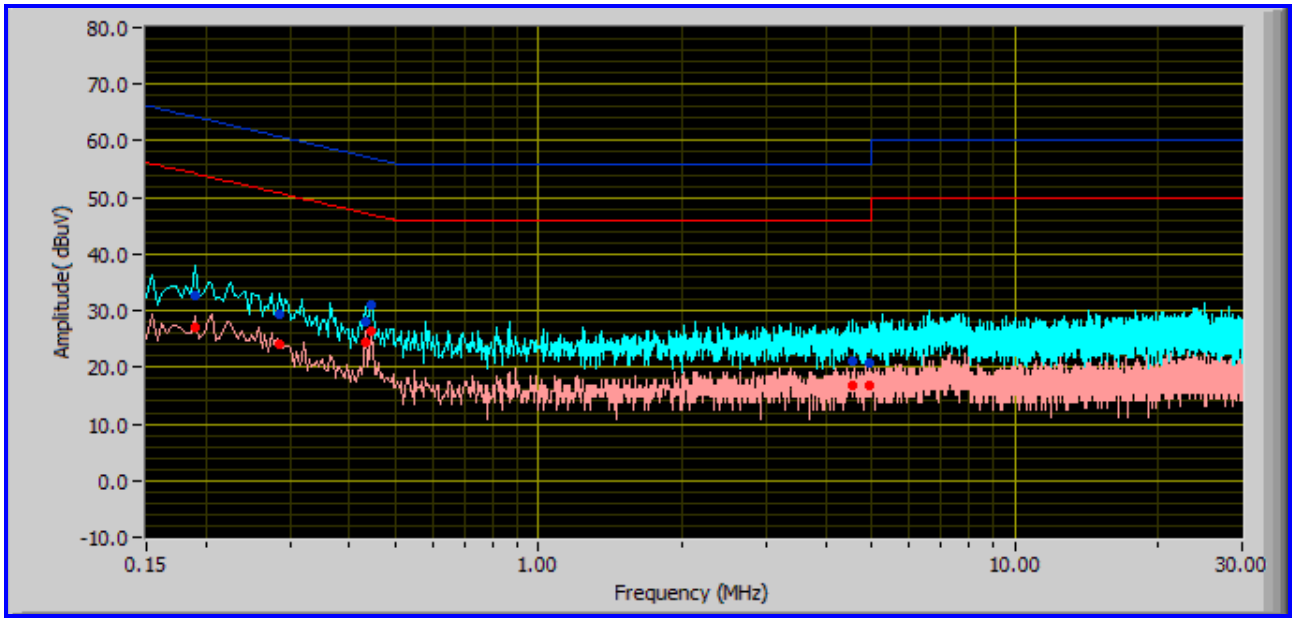
Conducted Emission Test Result on **2490C**@ TM#1



Quasi-Peak Limit Average Limit

110V, 60Hz, Neutral Line

Frequency (MHz)	QP Value (dBμV)	Class B Limit (dB)	Pass / Fail	Margin (dB)	Avg Value (dBμV)	Class B Limit (dB)	Pass / Fail	Margin (dB)	Line
0.45	30.98	56.96	PASS	-25.98	26.32	46.96	PASS	-20.64	Neutral
0.23	32.42	62.72	PASS	-30.30	26.80	52.72	PASS	-25.92	Neutral
0.43	28.53	57.19	PASS	-28.66	25.12	47.19	PASS	-22.07	Neutral
2.61	20.23	56.00	PASS	-35.77	15.79	46.00	PASS	-30.21	Neutral
3.91	20.76	56.00	PASS	-35.24	16.68	46.00	PASS	-29.32	Neutral
4.75	20.74	56.00	PASS	-35.26	16.66	46.00	PASS	-29.34	Neutral



Quasi-Peak Limit Average Limit

110V, 60Hz, Phase Line

Frequency (MHz)	QP Value (dBµV)	Class A Limit (dB)	Pass / Fail	Margin (dB)	Avg Value (dBµV)	Class A Limit (dB)	Pass / Fail	Margin (dB)	Line
0.45	31.18	56.96	PASS	-25.78	26.36	46.96	PASS	-20.61	Phase
0.19	32.65	64.19	PASS	-31.54	27.02	54.19	PASS	-27.16	Phase
0.43	27.89	57.19	PASS	-29.31	24.48	47.19	PASS	-22.71	Phase
4.58	20.94	56.00	PASS	-35.06	16.86	46.00	PASS	-29.14	Phase
0.29	29.50	60.73	PASS	-31.22	24.04	50.73	PASS	-26.68	Phase
4.95	20.93	56.00	PASS	-35.07	16.85	46.00	PASS	-29.15	Phase

5.3 LP0002: 2011 §4.11.3(3) Radiated Unwanted Emission Test Results

Standard Requirement: LP0002: 2011 §4.11.3(3)

(3.1) Any unwanted emissions shall not exceed the level of the fundamental emission.

(3.2) Emissions within the MICS band (402-405 MHz) more than 150 kHz away from the center frequency of the spectrum the transmission is intended to occupy, will be attenuated below the transmitter output power by at least 20dB. Compliance with this limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(3.3) Emissions 250kHz or less that are above and below the MICS band (402-405MHz) will be attenuated below the maximum permitted output power by at least 20dB. Compliance with this limit is based on the use of measurement instrumentation employing a peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

(3.4) Unwanted emissions more than 250kHz outside of the MICS band shall not exceed the general radiated emission limits in

Unwanted Emissions Limit

Frequency (MHz)	Field strength (micro-volts/meter)	Measurement distance (meters)
0.009 – 0.490 (inclusive)	2,400/Freq. (kHz)	300
0.490 (inclusive) – 1.705 (inclusive)	24,000/Freq. (kHz)	30
1.705 (exclusive) – 30 (exclusive)	30	30
30 (inclusive) – 88 (inclusive)	100	3
88 (exclusive) – 216 (inclusive)	150	3
216 (exclusive) – 960 (inclusive)	200	3
Above 960 (exclusive)	500	3

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	25ºC
Relative Humidity	50%
Atmospheric Pressure	1019mbar

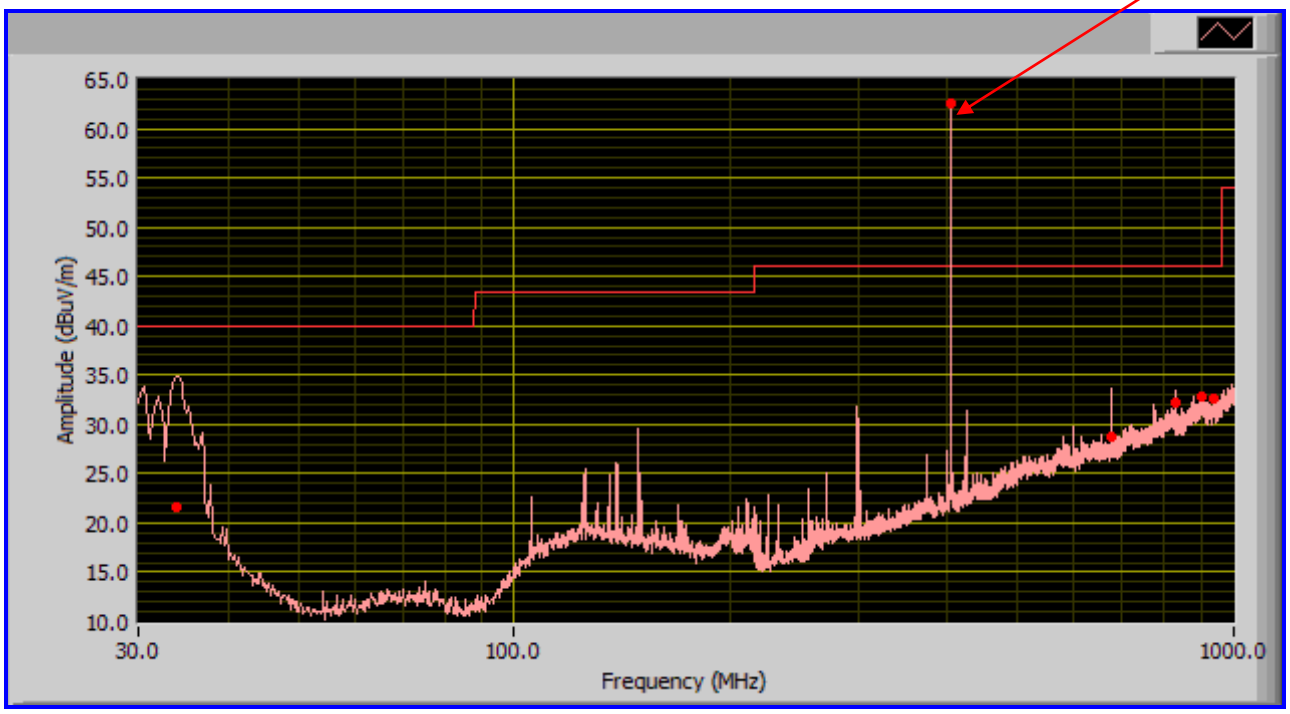
Test Date : November 10-15 2011
Tested By : Dan Coronia

Results: Pass

(Below 1 GHz)

a) (30MHz – 1000MHz) Low Channel 402.15MHz, TX Mode

Note: Measured at 3 meter



Radiated Emissions Plot

30MHz ~1000MHz

Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)
404.87	62.62	211.00	H	124.00	46.00	16.62
33.80	21.63	156.00	H	241.00	40.00	-18.37
674.98	28.80	237.00	H	215.00	46.00	-17.20
831.08	32.28	158.00	H	252.00	46.00	-13.72
900.38	32.77	272.00	H	34.00	46.00	-13.23
938.87	32.70	340.00	H	359.00	46.00	-13.30

(Above 1 GHz)

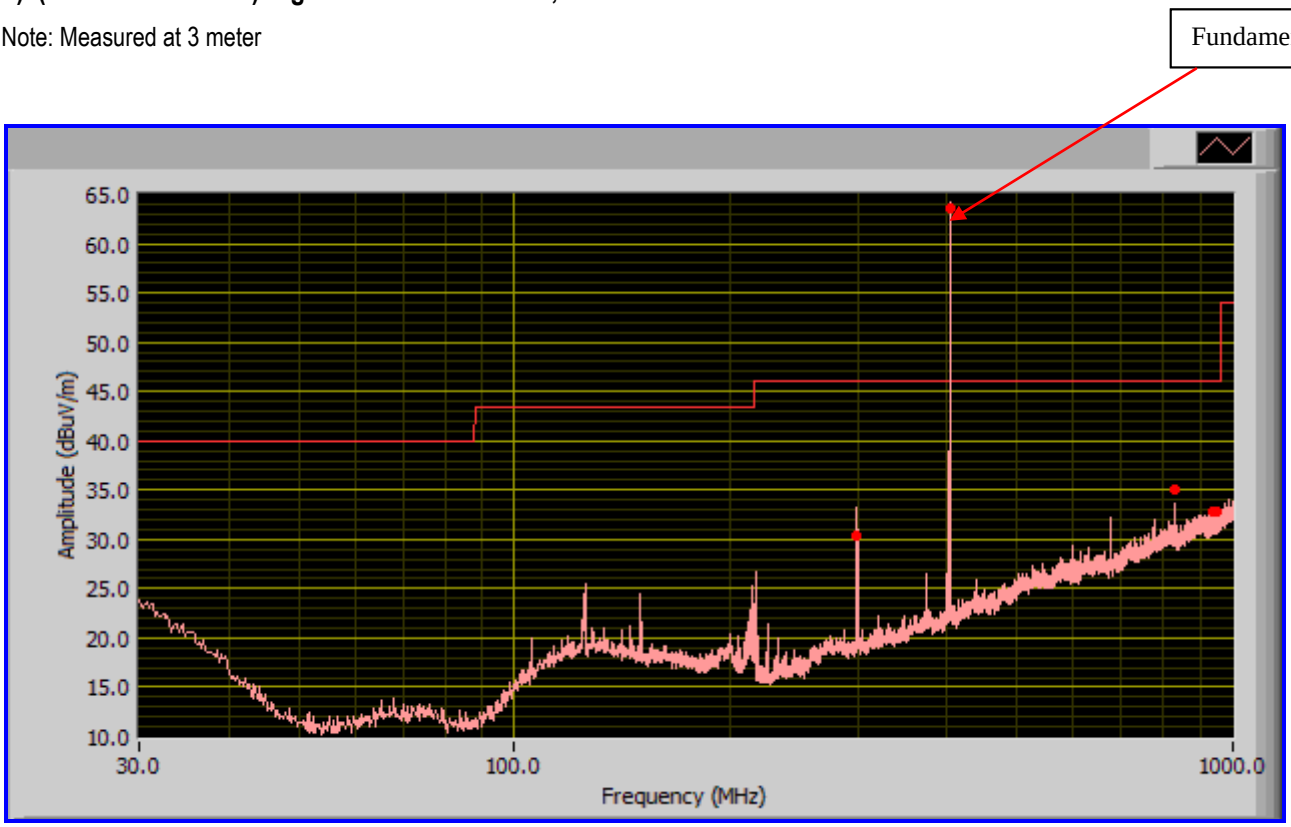
Frequency (GHz)	Azimuth (Degrees)	Antenna Polarity (H/V)	Height (m)	Raw Amp. @ 3m (dBuV)	Pre Amp. (dB)	Ant.Corr. Factor (dB)	Cable Loss (dB)	EUT Final Field Strength (dBuV/m)	Limit @ 3m (dBuV/m)	Delta (dBuV/m)	Detector (pk/avg)
1.21	28.00	H	1.10	37.51	31.98	25.10	1.67	32.30	74.00	-41.70	pk
1.21	28.00	H	1.10	33.64	31.98	25.10	1.67	28.43	54.00	-25.57	avg
1.21	40.00	V	1.50	36.52	31.98	25.10	1.67	31.31	74.00	-42.69	pk
1.21	40.00	V	1.50	34.61	31.98	25.10	1.67	29.40	54.00	-24.60	avg
1.61	45.00	H	1.30	37.14	31.99	26.17	1.93	33.25	74.00	-40.75	pk
1.61	45.00	H	1.30	33.32	31.99	26.17	1.93	29.43	54.00	-24.57	avg
1.61	40.00	V	1.60	36.15	31.99	26.17	1.93	32.26	74.00	-41.74	pk
1.61	40.00	V	1.60	34.26	31.99	26.17	1.93	30.37	54.00	-23.63	avg
2.01	44.00	H	1.30	36.77	32.04	27.91	2.11	34.75	74.00	-39.25	pk
2.01	44.00	H	1.30	33.20	32.04	27.91	2.11	31.18	54.00	-22.82	avg
2.01	52.00	V	1.70	35.74	32.04	27.91	2.11	33.72	74.00	-40.28	pk
2.01	52.00	V	1.70	33.90	32.04	27.91	2.11	31.88	54.00	-22.12	avg
2.41	63.00	H	1.40	36.42	32.06	28.59	2.33	35.28	74.00	-38.72	pk
2.41	63.00	H	1.40	32.68	32.06	28.59	2.33	31.54	54.00	-22.46	avg
2.41	30.00	V	1.60	35.45	32.06	28.59	2.33	34.31	74.00	-39.69	pk
2.41	30.00	V	1.60	33.59	32.06	28.59	2.33	32.45	54.00	-21.55	avg

Scan up to 5 GHz, No Other emission was found above 2.41 GHz

(Below 1 GHz)

b) (30MHz – 1000MHz) High Channel 404.85MHz, TX Mode

Note: Measured at 3 meter



Radiated Emissions Plot

30MHz ~1000MHz

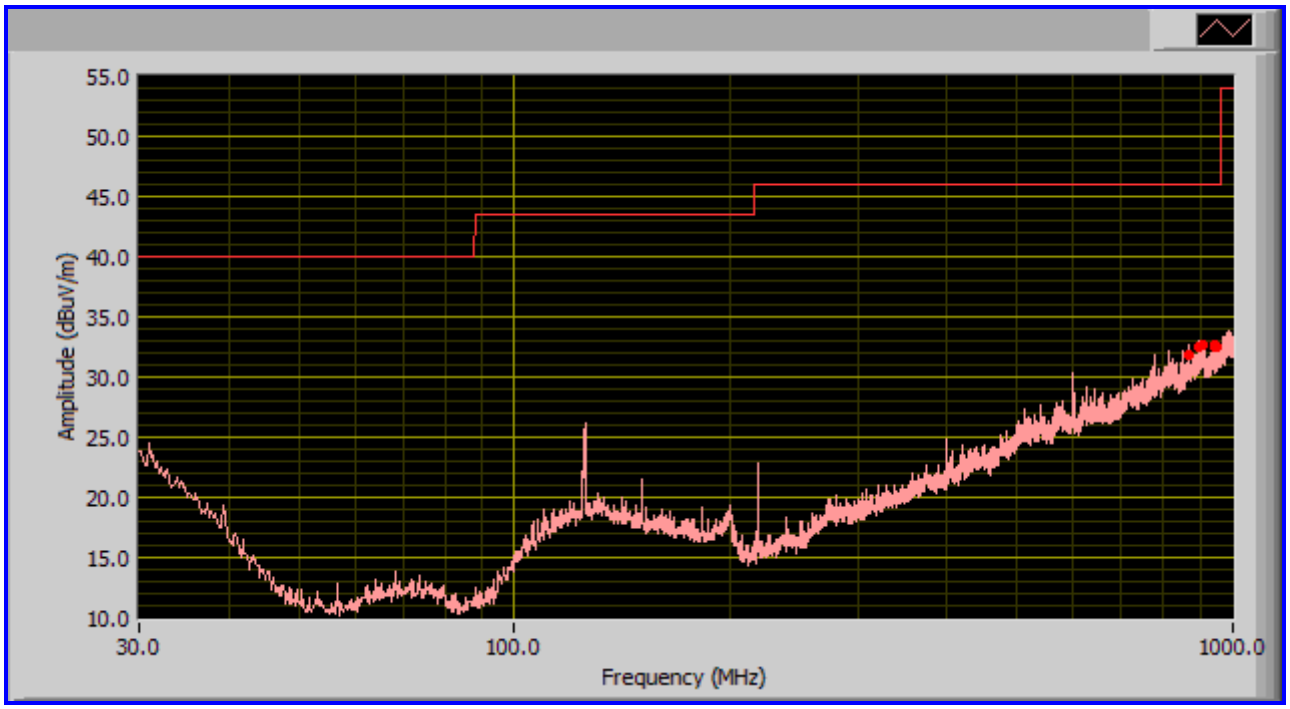
Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)
403.34	63.54	223.00	H	216.00	46.00	17.54
828.11	35.01	196.00	H	335.00	46.00	-10.99
300.00	30.40	122.00	H	89.00	46.00	-15.60
952.09	32.82	127.00	V	15.00	46.00	-13.18
947.84	32.75	173.00	V	348.00	46.00	-13.25
938.20	32.80	324.00	H	321.00	46.00	-13.20
403.34	63.54	223.00	H	216.00	46.00	17.54

Frequency (GHz)	Azimuth (Degrees)	Antenna Polarity (H/V)	Height (m)	Raw Amp. @ 3m (dBuV)	Pre Amp. (dB)	Ant.Corr. Factor (dB)	Cable Loss (dB)	EUT Final Field Strength (dBuV/m)	Limit @ 3m (dBuV/m)	Delta (dBuV/m)	Detector (pk/avg)
1.21	30.00	H	1.23	37.50	31.98	25.10	1.67	32.29	74.00	-41.71	pk
1.21	30.00	H	1.23	33.65	31.98	25.10	1.67	28.44	54.00	-25.56	avg
1.21	42.00	V	1.61	36.50	31.98	25.10	1.67	31.29	74.00	-42.71	pk
1.21	42.00	V	1.61	34.60	31.98	25.10	1.67	29.39	54.00	-24.61	avg
1.61	50.00	H	1.25	37.14	31.99	26.17	1.93	33.25	74.00	-40.75	pk
1.61	50.00	H	1.25	33.32	31.99	26.17	1.93	29.43	54.00	-24.57	avg
1.61	38.00	V	1.58	36.15	31.99	26.17	1.93	32.26	74.00	-41.74	pk
1.61	38.00	V	1.58	34.26	31.99	26.17	1.93	30.37	54.00	-23.63	avg
2.01	41.00	H	1.26	36.77	32.04	27.91	2.11	34.75	74.00	-39.25	pk
2.01	41.00	H	1.26	33.00	32.04	27.91	2.11	30.98	54.00	-23.02	avg
2.01	50.00	V	1.66	35.79	32.04	27.91	2.11	33.77	74.00	-40.23	pk
2.01	50.00	V	1.66	33.93	32.04	27.91	2.11	31.91	54.00	-22.09	avg
2.41	66.00	H	1.30	36.42	32.06	28.59	2.33	35.28	74.00	-38.72	pk
2.41	66.00	H	1.30	32.68	32.06	28.59	2.33	31.54	54.00	-22.46	avg
2.41	27.00	V	1.58	33.45	32.06	28.59	2.33	32.31	74.00	-41.69	pk
2.41	27.00	V	1.58	33.60	32.06	28.59	2.33	32.46	54.00	-21.54	avg

Scan up to 5 GHz, No Other emission was found above 2.41 GHz

(30MHz – 1000MHz) Low Channel 402.15MHz, RX Mode

Note: Measured at 3 meter



Limit

Radiated Emissions Plot

30MHz ~1000MHz

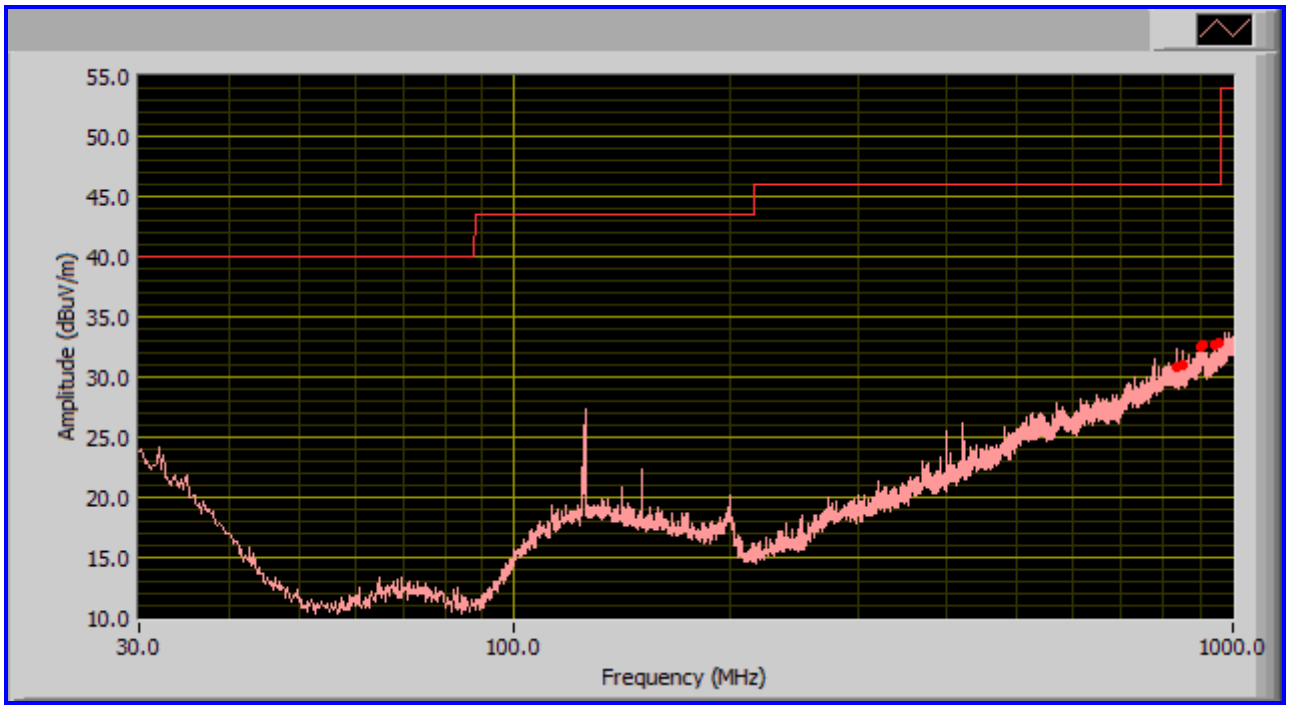
Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)
896.69	32.42	211.00	V	270.00	46.00	-13.58
866.02	31.78	338.00	V	167.00	46.00	-14.22
943.23	32.52	99.00	V	340.00	46.00	-13.48
940.97	32.59	337.00	H	56.00	46.00	-13.41
909.01	32.59	338.00	V	181.00	46.00	-13.41
951.91	32.48	338.00	V	106.00	46.00	-13.52

All Emission is at least 10 dB below limit.

Note: Scan up to 5GHz, No emission was found above 1 GHz.

(30MHz – 1000MHz) High Channel 404.85MHz, RX Mode

Note: Measured at 3 meter



Limit

Radiated Emissions Plot

30MHz ~1000MHz

Frequency (MHz)	Quasi-Peak (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Limit (dBµV/m)	Margin (dB)
942.30	32.62	337.00	H	100.00	46.00	-13.38
899.48	32.56	338.00	V	169.00	46.00	-13.44
835.13	30.86	130.00	H	165.00	46.00	-15.14
957.63	32.81	338.00	V	19.00	46.00	-13.19
909.99	32.59	337.00	V	51.00	46.00	-13.41
851.56	30.96	337.00	V	270.00	46.00	-15.04

All Emission is at least 10 dB below limit.

Note: Scan up to 5GHz, No emission was found above 1 GHz.

5.4 LP0002: 2011 §4.11.3(4) Frequency Tolerance

Test Requirement: LP0002: 2011 §4.11.3(4)

The frequency tolerance: Each transmitter in the MICS service must maintain a frequency stability of ±100 ppm of the operating frequency over the range: 25 to 45°C in the case of medical implant transmitters; and (2) 0 to 55°C in the case of medical implant programmer/control transmitters.

1. All possible modes of operation were investigated. The frequency tolerance of the carrier signal shall be maintained within +/-100ppm of the operating bands over a temperature variation of +25 degrees to +45 degrees C at normal supply voltage. For battery operated equipment, the equipment tests shall be performed using new battery.
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 0.5ppm
4. Environmental Conditions

Temperature	25°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : November 10-15 2011
Tested By : Dan Coronia

Operating Frequency 402.15MHz					Limit = ± 100 ppm			
Temp , Degree C	0 Min		2 Mins		5 Mins		10 Mins	
	(MHz)	PPM	(MHz)	PPM	(MHz)	PPM	(MHz)	PPM
45.00	402.153995	9.93	402.153985	9.91	402.153742	9.30	402.153454	8.59
37.00	402.153962	9.85	402.153774	9.38	402.153554	8.84	402.153631	9.03
25.00	402.152985	7.42	402.152861	7.11	402.152542	6.32	402.152655	6.60

Results: Pass

5.5 LP0002: 2011 §4.11.3(2) Occupied Bandwidth

Requirement(s): LP0002: 2011 §4.11.3(2)

(2.1) Maximal emission bandwidth: 300 kHz.

(2.2) The authorized bandwidth of the emission from a programmer/control transceiver shall not exceed 300kHz. Full duplex or half duplex communications can be adopted provided that the total amount of bandwidth utilized by all of the MICS channels employed in such a MICS communications session does not exceed 300kHz.

1. Conducted Measurement
EUT was set for low , mid, high channel with modulated mode and highest RF output power.
The spectrum analyzer was connected to the antenna terminal.

2 Environmental Conditions

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

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 30MHz – 40GHz is ±1.5dB.

4 Test Date : November 10-15 2011
Tested By : Dan Coronia

Protocol	Channel	Channel Frequency (MHz)	Occupied Bandwidth (KHz)	Occupied Bandwidth Limit (KHz)
MICS	Low	402.15	204.158	300
MICS	High	404.85	204.163	300

Results: Pass

5.6 LP0002: 2011 §4.11.3(1) Fundamental EIRP Test Result

Requirement specification: LP0002: 2011 §4.11.3(1)

(1.1) The maximum EIRP for MICS transmitter stations is 25 microwatts in any 300kHz band.

(1.2) The antenna associated with any MICS transmitter must be tested with the transmitter. Calculate EIRP with the radiated field strength at 3-meter distance to the EUT.

(1.3) The equivalent radiated field strength at 3 meters for 25 microwatts EIRP is 18.2mV/m when measured on an open area test site, or 9.1mV/m when measured on a test site equivalent to free space such as a fully anechoic test chamber.

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	23°C
Relative Humidity	50%
Atmospheric Pressure	1019mbar

Test Date : November 10-15 2011
Tested By : Dan Coronia

18.2 mV/m = 85.2 dBuV/m @ 3 meters

Frequency (MHz)	Peak (dBuV)	Azimut	Polarity	Height (cm)	Factors (dB)	Limit (dBuV)	Margin (dBuV)
402.15	56.30	0	H	1.25	18.2	85.2	-28.90
402.15	53.64	0	V	1.65	18.2	85.2	-31.56
404.85	54.34	0	H	1.30	18.2	85.2	-30.86
404.85	52.37	0	V	1.55	18.2	85.2	-32.83

Results: Pass

5.7 LP0002: 2011 §4.11.5 Frequency Monitoring (LBT measurement)

5.7.1 Emission Bandwidth (LBT measurement)

1. Conducted Measurement
EUT was set for low, mid, high channel with modulated mode and highest RF output power.
The spectrum analyzer was connected to the antenna terminal.

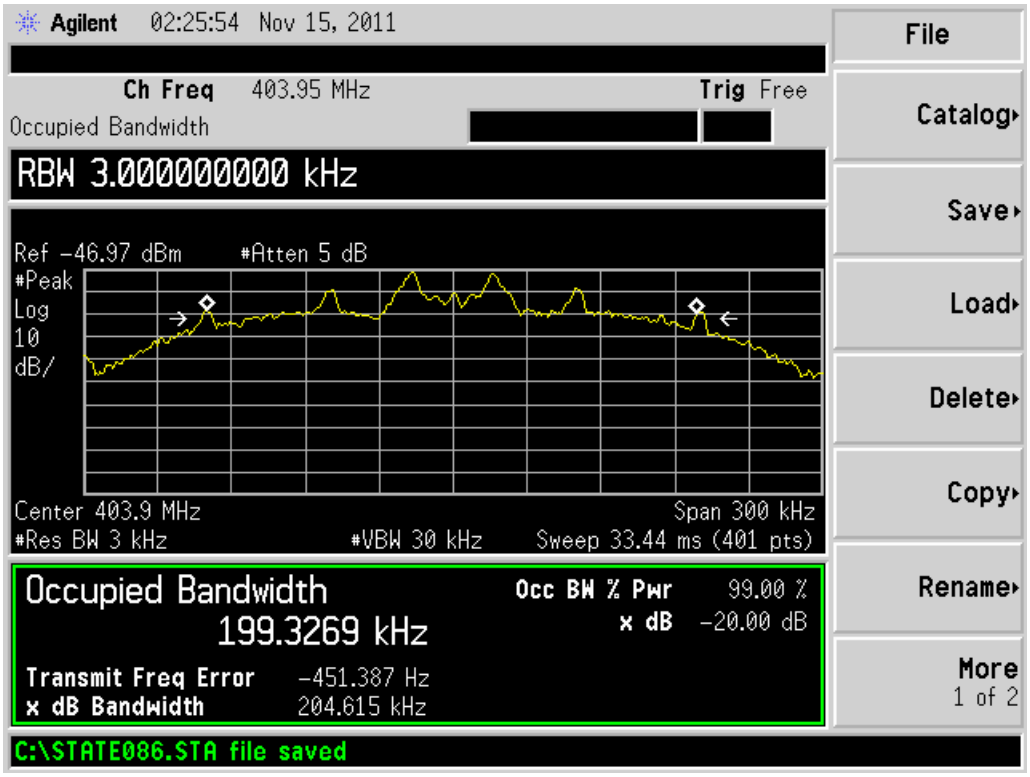
2 Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.

4 Test Date : November 10-15 2011
Tested By : Dan Coronia

Requirement specification: 8.2 of EN 301 839-1 V1.3.1

Protocol	Channel	Channel Frequency (MHz)	Emission Bandwidth (KHz)
MICS	Ch7	403.95	204.615



20dB Bandwidth at Ch7 (403.95MHz)

Results: Pass

5.7.2 LP0002: 4.11.5 (1.2) Threshold Power Level

Requirement specification: LP0002: 4.11.5 (1.2)

Based on use of an isotropic monitoring system antenna, the monitoring threshold power level must not be more than 10 logB (Hz) - 150 (dBm/Hz) + G (dBi) where B is the emission bandwidth of the MICS communication session transmitter having the widest emission and G is the medical implant programmer/control transmitter monitoring system antenna gain relative to an isotropic antenna.

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.
4. Test Date : November 10-15 2011
   Tested By : Dan Coronia

Test Procedure: Refer to LP0002:4.11.5(1.2) and 10.1 of EN 301 839-1 V1.3.1

Protocol	Channel	Channel Frequency (MHz)	Emission Bandwidth (KHz)	Antenna Gain (dBi)	Calculated Pth (dBm)	Measured Pth (dBm)	Result
MICS	Ch7	403.95	204.615	0	-96.89	-96.90	Pass

Legend: Pth – Power threshold

Results: Pass

5.7.3 LP0002: 4.11.5 (1.1) Monitoring System Scan Cycle Time

Requirement specification: LP0002: 4.11.5 (1.1)

Within 5 seconds prior to initiating a communications session, circuitry associated with a medical implant programmer/control transmitter must monitor the channel or channels the MICS system devices intend to occupy for a minimum of 10 milliseconds per channel.

Test Procedure: Refer to LP0002:4.11.5(1.1) and 10.3 of EN 301 839-1 V1.3.1

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.
4. Test Date : November 10-15 2011
   Tested By : Dan Coronia

Measured Scan Cycle time #1 = 1.88s
Measured Scan Cycle time #2 = 1.97s
Measured Scan Cycle time #3 = 2.04s
Measured Scan Cycle time #4 = 1.53s
Measured Scan Cycle time #5 = 1.81s
Measured Scan Cycle time #6 = 1.77s
Measured Scan Cycle time #7 = 1.62s
Measured Scan Cycle time #8 = 1.89s
Measured Scan Cycle time #9 = 1.93s
Measured Scan Cycle time #10 = 1.93s

Protocol	Channel	Channel Frequency (MHz)	Measured Avg Scan Cycle time (s)	Measured Maximum Scan Cycle time (s)	Scan Cycle Time Limit (s)	Result
MICS	Ch7	403.95	1.84	2.04	5	Pass

Results: Pass

5.7.4 LP0002: 4.11.5 (1.1) Minimum Channel Monitor Period

Requirement specification: LP0002: 4.11.5 (1.1)

Within 5 seconds prior to initiating a communications session, circuitry associated with a medical implant programmer/control transmitter must monitor the channel or channels the MICS system devices intend to occupy for a minimum of 10 milliseconds per channel.

Test Procedure: Refer to LP0002:4.11.5(1.1) and 10.3 of EN 301 839-1 V1.3.1

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.
4. Test Date : November 10-15 2011
   Tested By : Dan Coronia

Protocol	Channel	Channel Frequency (MHz)	Channel Monitor Period Limit(ms)	Measured Channel Monitor Period (ms)	Result
MICS	Ch7	403.95	10	>10	Pass

Results: Pass

5.7.5 LP0002: 4.11.5 (1.3) Access to the Lowest Ambient Power Level Channel

Requirement specification: LP0002: 4.11.5 (1.3)

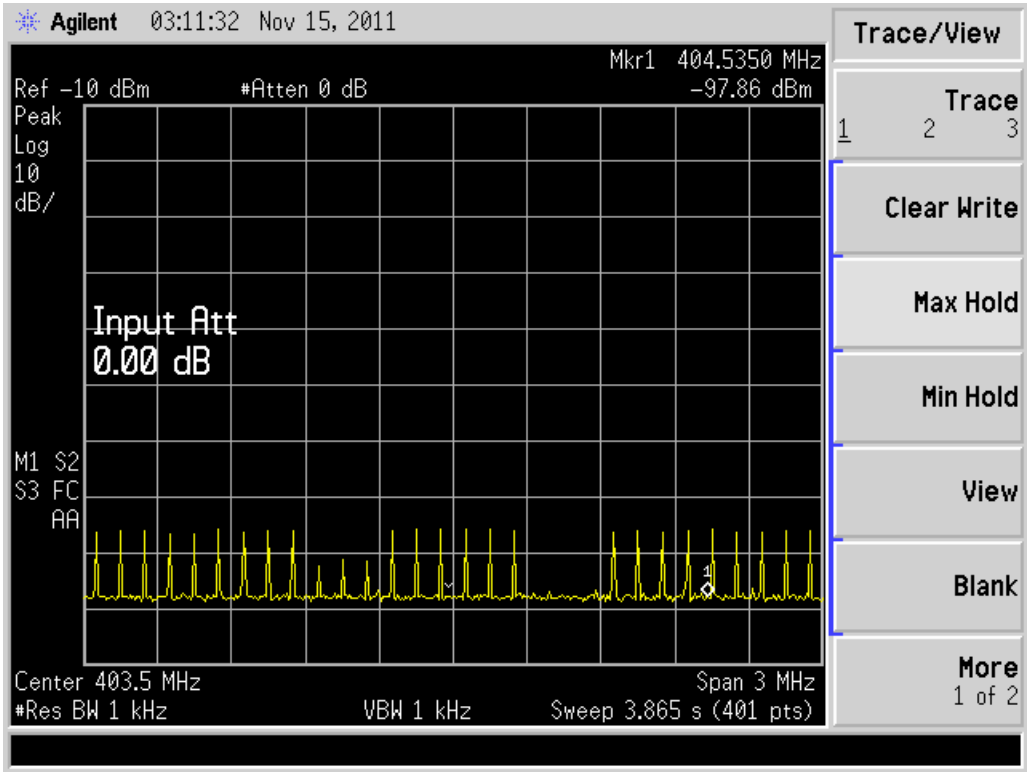
If no signal in a MICS channel above the monitoring threshold power level is detected, the medical implant programmer/control transmitter may initiate a MICS communications session involving transmissions to and from a medical implant device on that channel. If a channel meeting the criteria in Section 4.11.5 (1.2) of this section is unavailable, the channel with the lowest ambient power level may be accessed.

Test Procedure: Refer to LP0002:4.11.5(1.3) and 10.4 of EN 301 839-1 V1.3.1

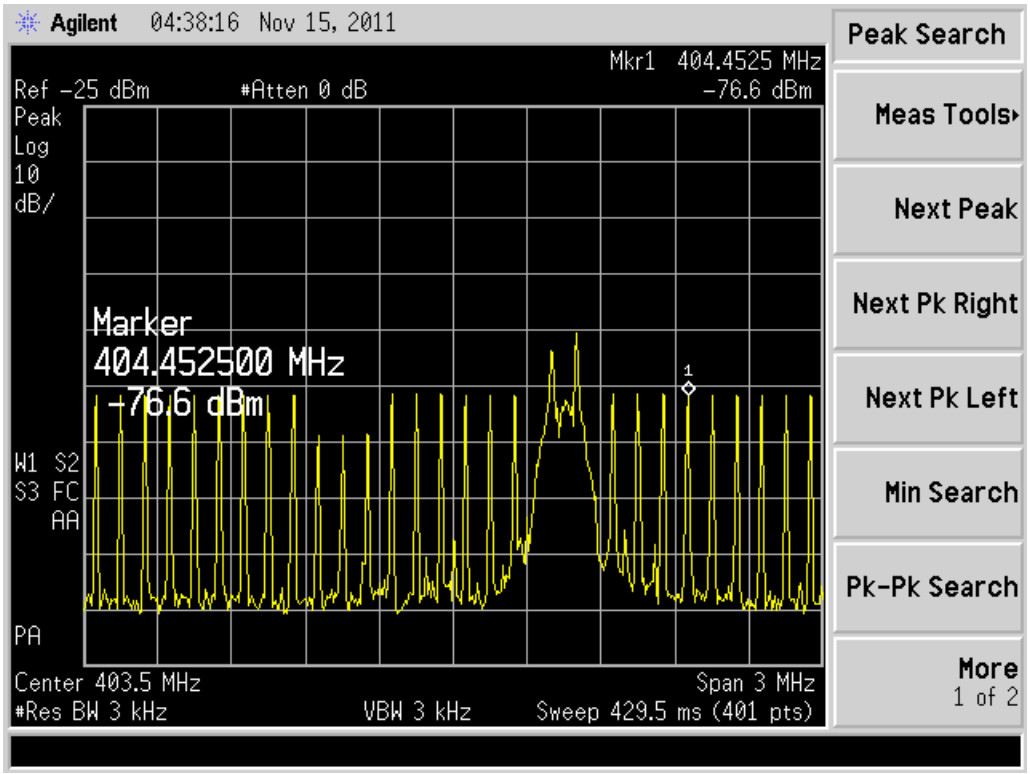
1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.
4. Test Date : November 10-15 2011
   Tested By : Dan Coronia

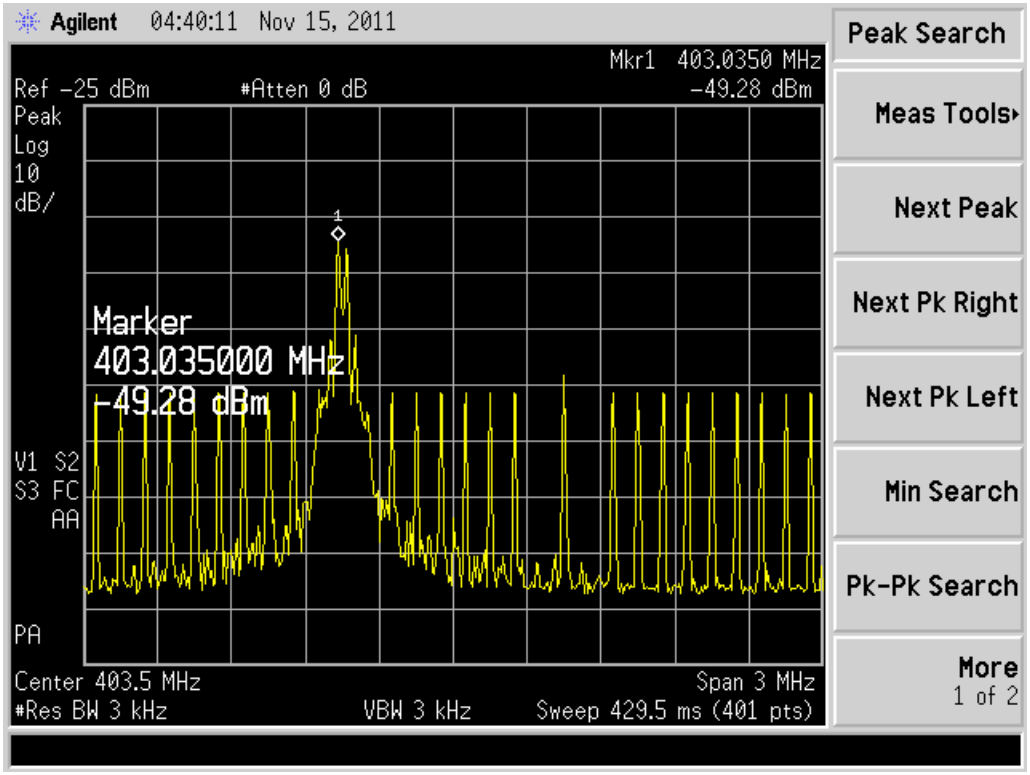
Results: Pass



LIC Channel at Ch4 (403.50MHz) with test channel (Ch7 at 403.95MHz)



EUT transmitting at test Channel (Ch7 at 403.95MHz)



EUT transmitting at test LIC Channel (Ch3 at 403.05MHz) after the Ch7 was used

5.7.6 LP0002: 4.11.5 (1.3) Discontinuation of Session With 5 s Silent Period

Requirement specification: LP0002: 4.11.5 (1.3)

If no signal in a MICS channel above the monitoring threshold power level is detected, the medical implant programmer/control transmitter may initiate a MICS communications session involving transmissions to and from a medical implant device on that channel. If a channel meeting the criteria in Section 4.11.5 (1.2) of this section is unavailable, the channel with the lowest ambient power level may be accessed.

Test Procedure: Refer to LP0002:4.11.5(1.3) and 10.5 of EN 301 839-1 V1.3.1

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.
4. Test Date : November 10-15 2011
   Tested By : Dan Coronia

Measured cease transmission time #1 = 2.94s
Measured cease transmission time #2 = 2.43s
Measured cease transmission time #3 = 2.26s
Measured cease transmission time #4 = 2.30s
Measured cease transmission time #5 = 2.92s
Measured cease transmission time #6 = 2.28s
Measured cease transmission time #7 = 2.09s
Measured cease transmission time #8 = 2.73s
Measured cease transmission time #9 = 2.63s
Measured cease transmission time #10 = 2.48s

Protocol	Channel	Channel Frequency (MHz)	Measured Avg cease transmission time (s)	Measured Maximum cease transmission time (s)	Cease transmission time (s)	Result
MICS	Ch7	403.95	2.51	2.94	5	Pass

Results: Pass

5.7.7 LP0002: 4.11.5 (1.4) Use of Pre-scanned Alternate Channel

Requirement specification: LP0002: 4.11.5 (1.4)

When a channel is selected prior to a MICS communications session, it is permissible to select an alternate channel for use if communications is interrupted, if the alternate channel selected is the next best choice using the above criteria. The alternate channel may be accessed in the event a communications session is interrupted by interference. The following criteria must be met:
(i) Before transmitting on the alternate channel, the channel must be monitored for a period of at least 10 milliseconds.
(ii) The detected power level during the monitoring period must be no higher than 6 dB above the power level detected when the channel was chosen as the alternate channel.
(iii) In the event that this alternate channel provision is not used by the MICS system or if the criteria in (i) and (ii) are not met, a channel must be selected using the access criteria specified in Section 4.11.5 (1.1) through Section 4.11.5 (1.3).

Test Procedure: Refer to 5.9 of attachment annex D

1. Conducted Measurement
   EUT was set for low , mid, high channel with modulated mode and highest RF output power.
   The spectrum analyzer was connected to the antenna terminal.
2. Environmental Conditions

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 30MHz – 40GHz is ±1.5dB.
4. Test Date : November 10-15 2011
   Tested By : Dan Coronia

Results: N/A

Note: The particular EUT does not employ the provision for a pre-scanned alternate channel, so this test is not necessary.

Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Model	Serial #	Calibration Date	Calibration Due	Duration
Conducted Emissions					
R & S Receiver	ESIB 40	100179	05/19/2011	05/19/2012	1 year
R&S LISN	ESH2-Z5	861741/013	05/18/2011	05/18/2012	1 year
CHASE LISN	MN2050B	1018	05/18/2011	05/18/2012	1 year
Sekonic Hygro Hermograph	ST-50	HE01-000092	06/04/2011	06/04/2012	1 year
Radiated Emissions					
R & S Receiver	ESIB 40	100179	05/19/2011	05/19/2012	1 year
Sunol Sciences, Inc. antenna (30MHz~2GHz)	JB1	A030702	06/01/2011	06/01/2012	1 year
3 Meters SAC	3M	N/A	10/13/2011	10/13/2012	1 year
10 Meters OATS	10M	N/A	06/17/2011	06/17/2012	1 year
Sekonic Hygro Hermograph	ST-50	HE01-000092	06/04/2011	06/04/2012	1 year
Test Equity Environment Chamber	1007H	1007H	06/01/2011	06/01/2012	1 year
Permitted Freq Range					
R & S Receiver	ESIB 40	100179	05/19/2011	05/19/2012	1 year
TestEquity Environment Chamber	1007H	61201	06/01/2011	06/01/2012	1 year
Sekonic Hygro Hermograph	ST-50	HE01-000092	06/04/2011	06/04/2012	1 year
Frequency Monitoring (LBT)					
Synthesized Sweep Generator (10M-40GHz)	68169B	973407	5/17/2011	5/17/2012	1 year
Signal Generator with Multitone capability	E4438C	MY42082922	10/27/2011	10/27/2012	1 year
Spectrum Analyzer	E4407B	MY44211923	10/15/2011	10/15/2012	1 year
Sekonic Hygro Hermograph	ST-50	HE01-000092	06/04/2011	06/04/2012	1 year

Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

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 1m x 0.8m high, non-metallic table, as shown in Annex B.

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

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

4. 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 100kHz – 1GHz to 10th Harmonic , was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

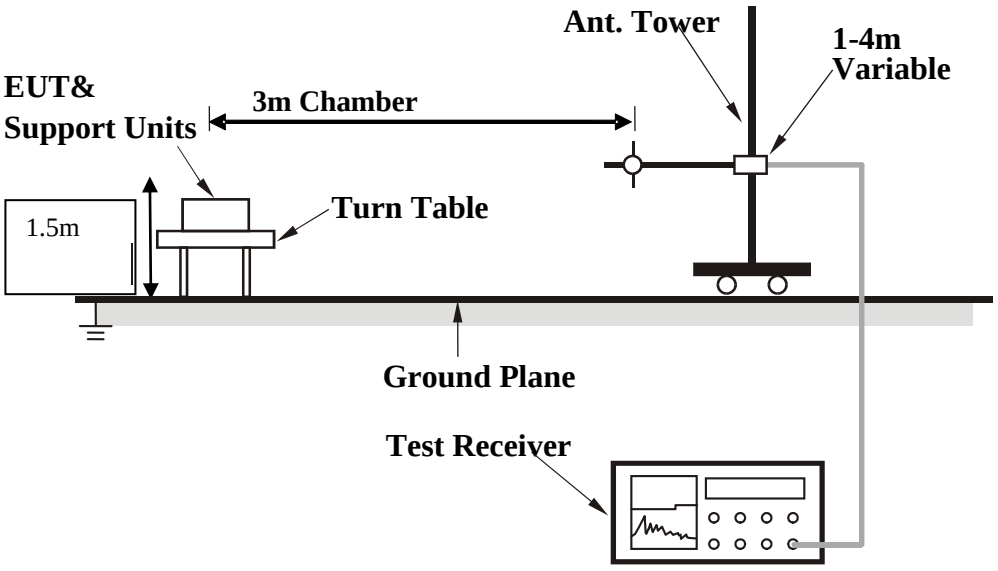
The EUT was placed in the chamber, at a height of about 1.5m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver.

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.

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

The following procedure was performed to determine the maximum emission axis of EUT:
1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement
1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below 1 GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on a open test site. As the same purpose, for emission frequencies measured above 1 GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below 1 GHz, set the spectrum analyzer on a 100 kHz and 1 MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0 ◦ to 360 ◦ with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.

5. Repeat step 4 until all frequencies need to be measured were complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	100 kHz	100 kHz
Above 1000	Peak	1 MHz	1 MHz
	Average	1 MHz	10 Hz

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

Where
Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)
And the average value is

Average = Peak Value + Duty Factor or
Set RBW = 1MHz, VBW = 10Hz.

Note :
If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1 GHz. And the measuring instrument is set to quasi peak detector function.

Annex B EUT AND TEST SETUP PHOTOGRAPHS

Annex B.i. Photograph 1: EUT External Photo

EUT – Front View

EUT – Back View

EUT – Left Side View

EUT – Right Side View

Annex B.ii. Photograph 3: EUT Internal Photo

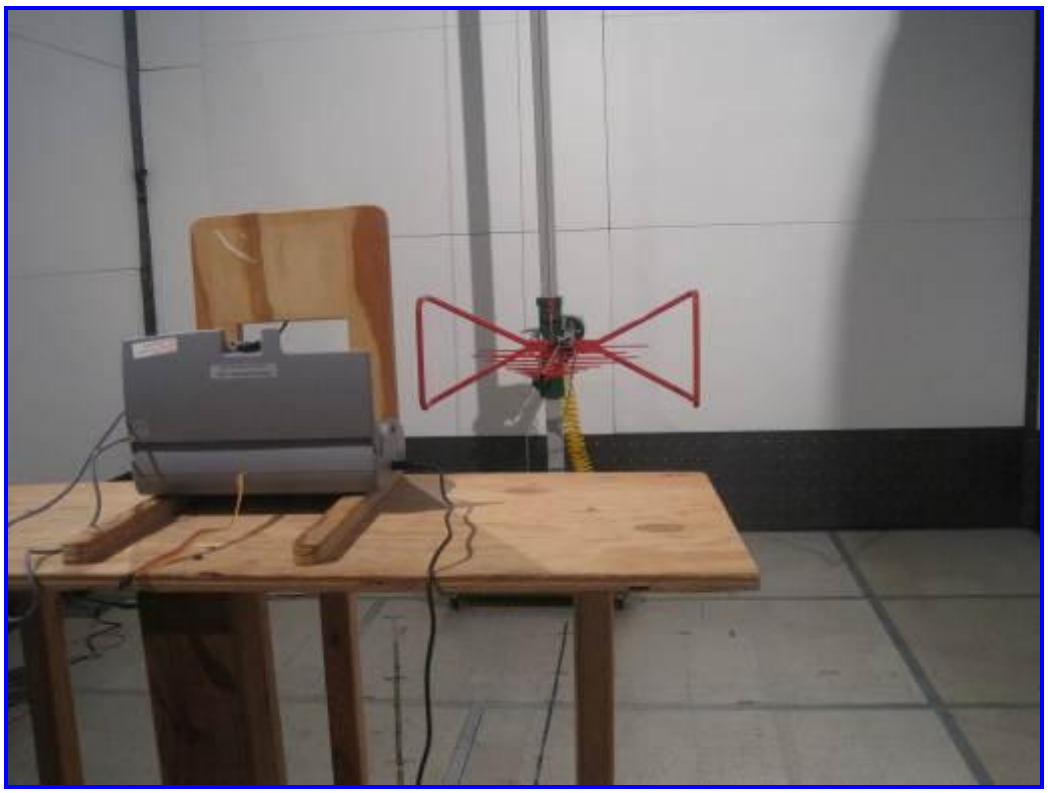
Please refer to the Internal Photos file: 2490C Interior Photographs.pdf

Annex B.iii. Photograph 3: Test Set up Photo

Conducted Emission Set up - Front View

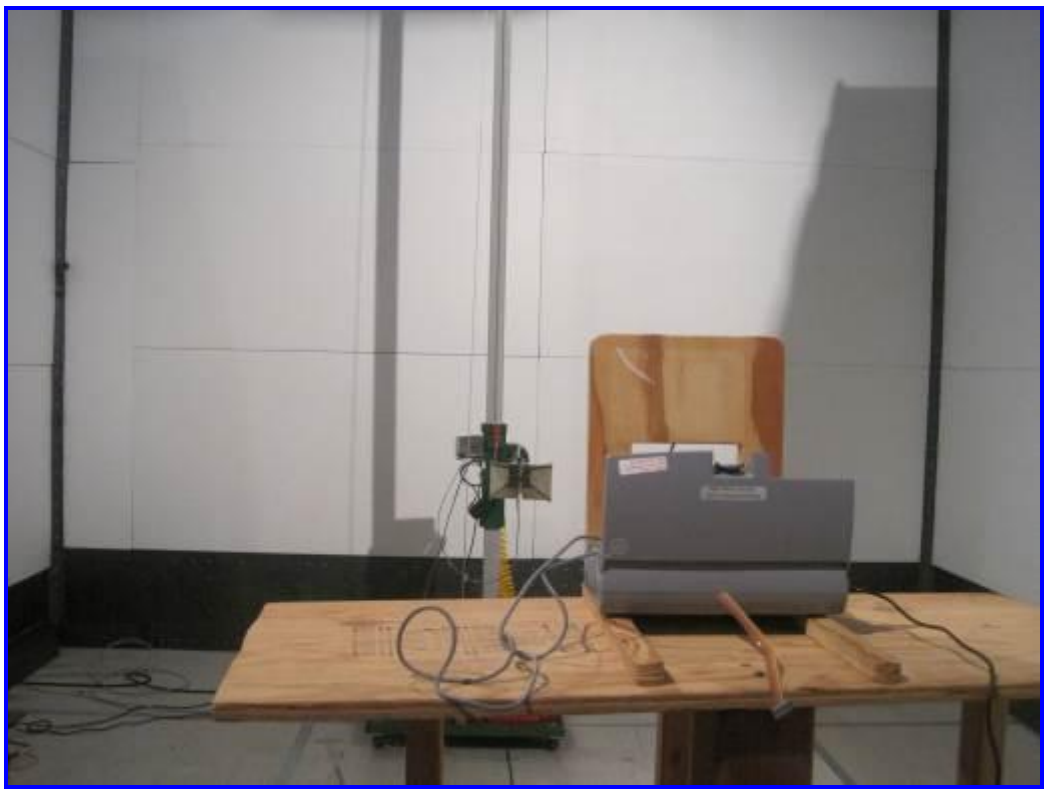
Conducted Emission Set up – Rear View

Radiated Emission Set up (<30MHz) – Front View

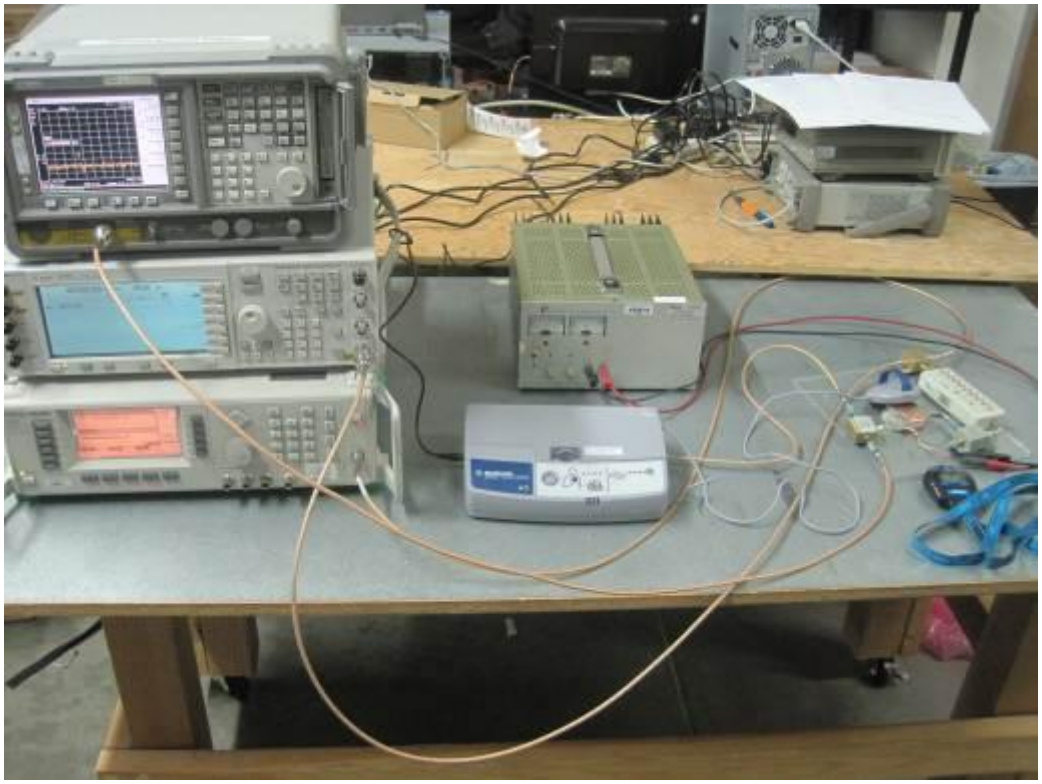


Radiated Emission Set up (<30MHz) – Rear View

Radiated Emission Set up (>30MHz) – Front View



Radiated Emission Set up (>30MHz) – Rear View

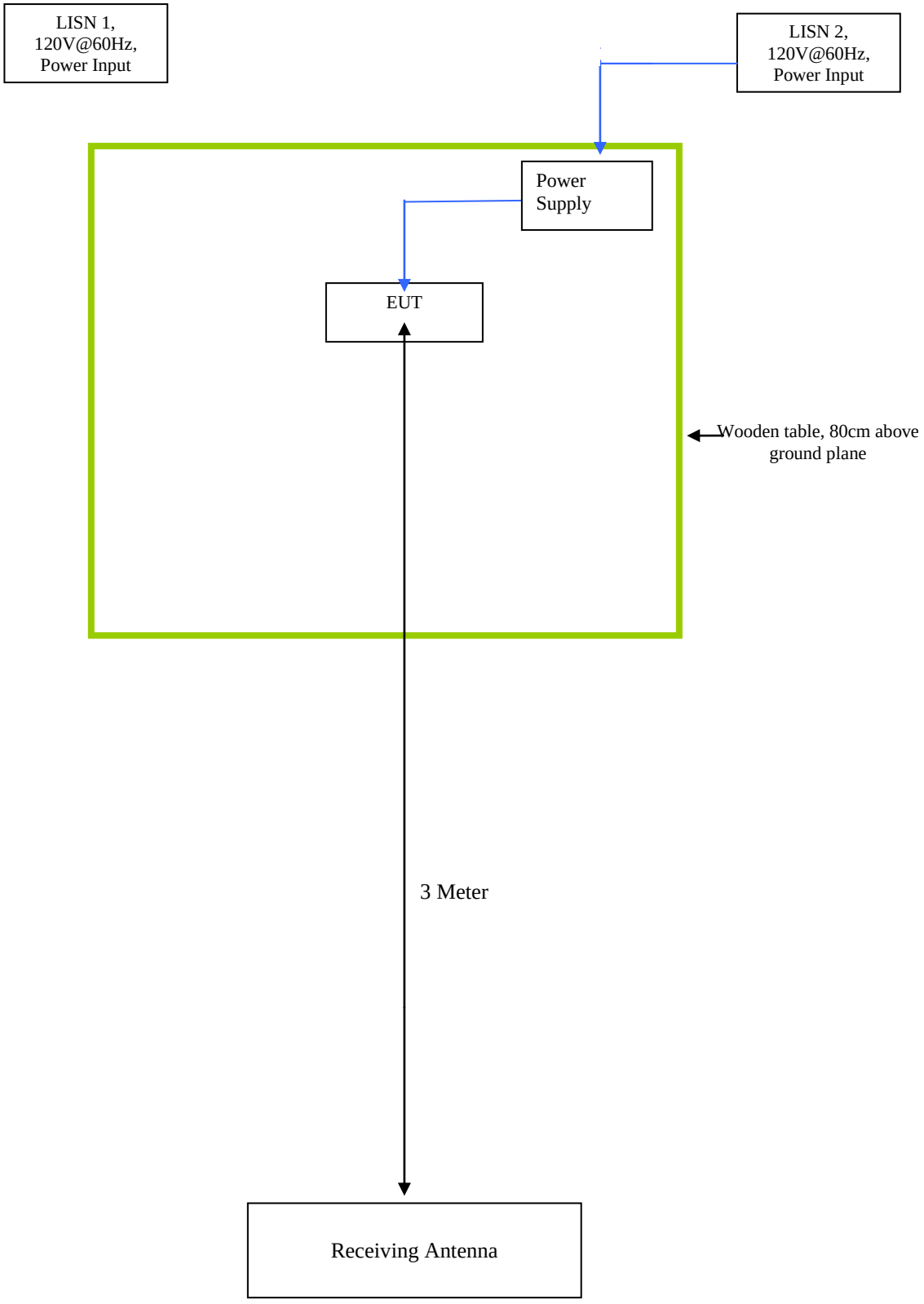


Frequency Monitoring (LBT) testing setup

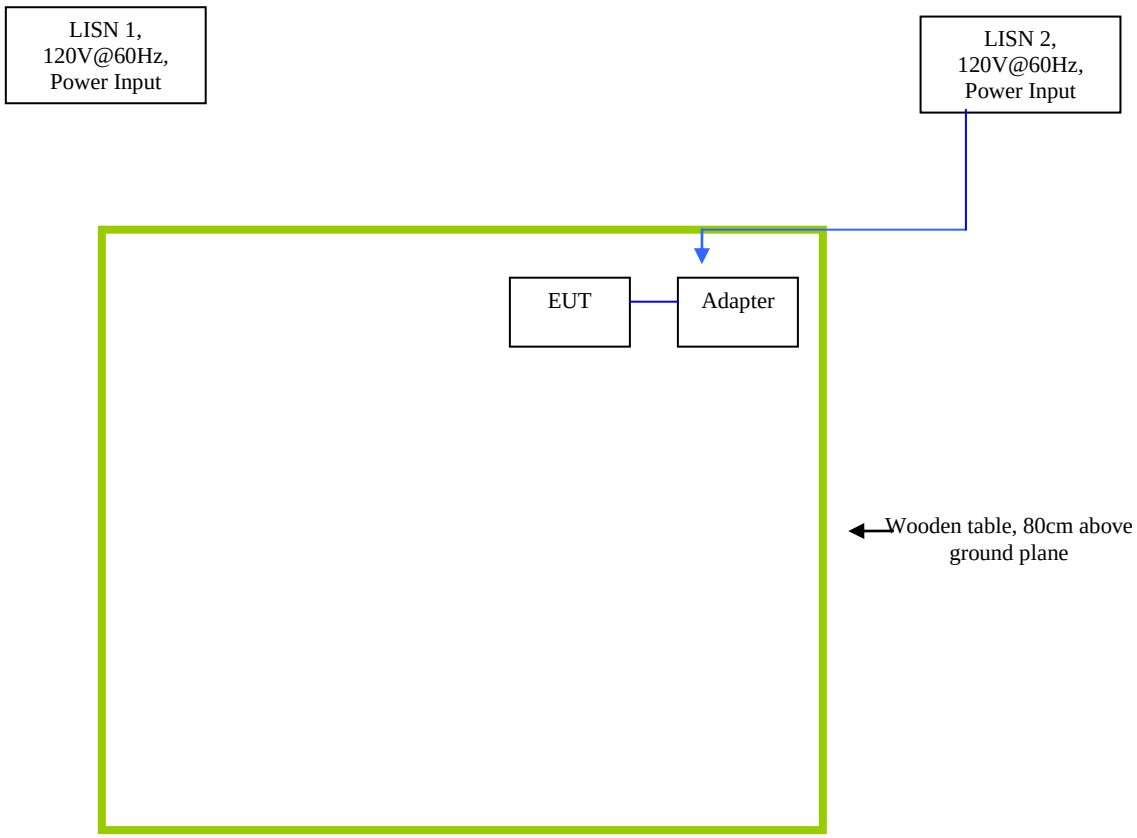
Annex C. TEST SETUP

Annex C.i. EUT Test Setup Block Diagram

Block Configuration Diagram for Radiated Emission



Block Configuration Diagram for AC Conducted Emission



Annex C.ii. PASS / FAIL CRITERIA & MONITORING METHODS

For compliance to the immunity requirements of the Directive, the EUT must comply with the correct Performance Criteria (Continuous, Transient phenomena) stipulated in the relevant standard.

Performance Criteria A (Continuous phenomena) – the equipment should continue as intended without operator intervention. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer when the equipment is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible loss is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment id used as intended.

Performance Criteria B (Transient phenomena) – After the test, the equipment shall continue to operate as intended without operator intervention. No degradation of performance or loss of function is allowed, after the application of the phenomena below a performance level specified by the manufacturer, when the equipment is used as intended. The performance level mat be replaced by a permissible loss of performance.

During the test, degradation of performance is allowed. However, no change of operating state or store data is allowed to persist after the test.

If the minimum performance level (or the permissible performance loss) is not specified by the manufacturer, then either of these may be derived from the product description and documentation, and by what the user may reasonably expect from the equipment id used as intended.

Please refer to the standard for the full Performance Criteria description.

Annex D USER MANUAL, BLOCK & CIRCUIT DIAGRAM

Please see attachment