



Underwriters Laboratories Inc.

www.ul.com/emc
www.ul.co.kr

Project: 08CA53110
File: TC8340
Report: 08CA53110-FCC
Date: December 22, 2008
Model: MiroCam Capsule Endoscope System
FCC ID: VAXINTROMEDIC

FCC Evaluation Report for Certification

Class II Permissive Change

For

Capsule Endoscope & Receiver

INTROMEDIC CO., LTD.

SUITE 1101, E&C VENTURE DREAM TOWER 6-CHA 197-28 GURO-DONG,
GURO-GU, SEOUL, KOREA

Copyright © 2005 Underwriters Laboratories Inc.

Underwriters Laboratories Inc. authorizes the above-named company to reproduce this Report provided it is reproduced in its entirety.

Only those products bearing the UL Mark should be considered as being covered by UL.

UL Korea, Ltd
33rd FL, Gangnam Finance Center, 737
Yeoksam-dong, Gangnam-gu, Seoul
135-984 Korea
Tel: +82.2.2009.9000, Fax: +82.2.2009.9405

A not-for-profit organization dedicated
to public safety and committed to
quality service for over 100 years

Summary of Test Results:

The following tests were performed on a sample submitted for evaluation of compliance with FCC Part 15 Subpart B Class B

Clause	Test Requirement	Compliant	Not Compliant	See Remark
15.107	Conducted emissions on AC power Ports	PASS	-	-
15.109	Radiated emission	PASS	-	-

This equipment has been shown to be in compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-2003

Conclusion:

The tests listed in the Summary of Testing section of this report have been performed as a witness testing and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to the Equipment Under Test. As a result, the subject product has been verified to comply or not comply as noted in the Summary of Testing with each test specification. The test results relate only to the items tested.

The equipment under test has

Met the technical requirements
 Not met the technical requirements



Tested by
Jeawoon Choi, Senior Project Engineer
Conformity Assessment Services – 3014ASEO
UL Korea Ltd.
December 22, 2008



Reviewed by
Kyungyong Kim, EMC Section Manager
Conformity Assessment Services – 3014ASEO
UL Korea Ltd.
December 22, 2008

Test Report Details

Tests Performed By: UL Korea Ltd.
33rd FL. Gangnam Finance Center 737 Yeoksam-dong,
Kangnam-ku, Seoul, 135-984, Korea

Test Site: ESTECH Co.,Ltd.
97-1, Hoeok-Ri Majang-Myun Icheon-City, Kyonggi-Do Korea

Tests Performed For: INTROMEDIC CO., LTD
SUITE 1101, E&C VENTURE DREAM TOWER 6-CHA
197-28 GURO-DONG, GURO-GU, SEOUL, KOREA

Applicant Contact: Chang-Ho, Moon
Title: Manager
Phone: +82-2-801-9381
Fax: +82-2-801-9330
E-mail: chmoon@intromedic.com

Test Report Date: November 13, 2008

Product Type: Capsule Endoscope & Receiver

Trade Name: MiroCam

Model Name: MiroCam Capsule Endoscope System
(This system is consisted of Capsule endoscope(MC1000-C),
Receiver(MR1000-R) and Charger(MR1000-C))

FCC ID: VAXINTROMEDIC

FCC Rule Part(s): FCC Part 15 Subpart B Class B

FCC Classification: Class B Digital Device

FCC Procedure: Class II Permissive Change

Sample Receive Date: November 13, 2008

Testing Start Date: November 13, 2008

Date Testing Complete: December 16, 2008

Overall Results: **PASS**

UL Korea Ltd. reports apply only to the specific samples tested under stated test conditions. All samples tested were in good operating condition throughout the entire test program. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. UL Korea Ltd. shall have no liability for any deductions, inferences or generalizations drawn by the client or others from UL Korea Ltd. issued reports. This report shall not be used to claim, constitute or imply product certification, approval, or any agency of the US government.

Report Directory

1 Description of Test Facility	5
1.1 Official Qualification(s)	5
2 Equipment Description	6
2.1 Equipment Used During Test	7
2.2 Input/Output Ports	7
2.3 Power Interface	7
2.4 EUT Operation Modes & Configurations	8
2.5 Test Configurations:	8
3 Test Conditions and Results – Conducted Emission	9
4 Test Conditions and Results – Radiated Emission	14

Project Number: 08CA53110 File Number: TC8340 Date of Issue :
Model Number: MicoCam Capsule Endoscope System December 22, 2008

1 Description of Test Facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions From Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ASNI C63.4-2003) was used in determining radiated and conducted emissions emanating from INTROMEDIC CO., LTD. Capsule Endoscope & Receiver (Model No.: MiroCam Capsule Endoscope System)

- ESTECH Co.,Ltd.-
- 97-1, Hoeok-Ri Majang-Myun Icheon-City Kyonggi-Do Korea

1.1 Official Qualification(s)

KCC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication (reference no : KR0033)

FCC : Filed Laboratory at Federal Communications Commission (reference no : 100749)

VCCI : Granted Accreditation from Voluntary Control Council for Interference from ITE (reference no : C-1872, R-1757)

2 Equipment Description

The Equipment Under Test (EUT) is the INTROMEDIC CO., LTD. Capsule Endoscope & Receiver (Model No.: MiroCam Capsule Endoscope System)

Capsule Endoscope	
Weight : 3.45g	Size : 11 X 24mm
Light : 6 white LED	Material : Human Compliance Plastic
Lens Angle : 125°	View Angle : 150°
Enlargement Ratio : 1:8	View Depth : 3 cm
Sampling Ratio : 2.96 fps	Detectable Range : under 0.1mm
Mechanical Safety : Compatible ISO60601-1-1	Working time : Over 11 hours
Battery Type : Silver Oxide Cell	Chemical Safety : Safe in pH=2 ~ pH=8
Storage Temperature : 0 ~ 50 °C	Operation Temperature : 20 ~ 40 °C

Capsule Endoscope Receiver Set	
Recording Time : 11 Hours	Weight : 350g, include battery
Operation Voltage : 3.7V, 0.45A	Battery Type: Lithium Ion Battery (3.7V, 8.8A)
Battery Weight : 215g	Operation Temperature : 0 ~ 40 °C
Storage Temperature : 0 ~ 55 °C	Category : Type BF

Software Specification _ Version: 1.00	
Data Export : JPEG Image, AVI Video Clip, PDF Data Report	Data Display : Single or Multi Image, Time Bar, Color Bar, Diagnosis Data
Event Marker : Small Image with Explanation	Running Mode : Normal Mode, Fast Mode
Display Mode:Single View, Dual View, Quad View	Image Lost Ratio : Under 100 frame continuously
Display Ratio : 5 ~ 30 fps	Language : English

Charger	Adapter
Input Current : 3A	Manufacturer : AULT KOREA Corp
Output Current : 4A	Model name : JMW128KA0902F02
Input Voltage : 110~220VAC	Input : 100-240V, 50/60Hz 1.0A
Output Voltage ; 4.2VDC	Output : 9Vdc, 3.0A

2.1 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
o	Capsule Endoscope & Receiver	INTROMEDIC CO.,LTD	MiroCam Capsule Endoscope System	EUT
o	Battery charger	INTROMEDIC CO.,LTD	MR1000-C	EUT
o	Adapter	AULT KOREA CORP.	JMW128KA0902F02	EUT
o	UMPC	SAMSUNG	NT-Q1U	N/A
o	Adapter	AULT KOREA CORP.	JMW160KA1800F01	N/A
o	Test Fixture	INTROMEDIC CO.,LTD	N/A	AE

Note: *Use = EUT - Equipment Under Test, AE - Auxiliary/Associated Equipment, or
 SIM - Simulator (Not Subjected to Test)

2.2 Input/Output Ports

Port #	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
1	Main power input	AC	1.80	Unshielded	Connected with Adapter
2	Adapter output	DC	1.45	Shielded	Connected with EUT
3	Mini USB port	I/O	1.5	Shielded	Connected with EUT and PC
4	Signal port	I/O	0.95	Shielded	Connected with EUT and Test fixture

Note: *AC= AC Power Port, DC = DC Power Port, N/E = Non-Electrical, TP= Telecommunication Ports
 I/O = Signal Input or Output Port (Not Involved in Process Control)

2.3 Power Interface

Mode #	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (#)	Comments
Rated	100~240Vac	1.0	-	50-60	1	Input of AC/DC Adapter
	9Vdc	3.0	-	-	-	Output of AC/DC Adapter
	3.7Vdc	0.45	-	-	-	Battery of Capsule Endoscope Receiver Unit

2.4 EUT Operation Modes & Configurations

Mode #	Description
Download	The picture in the memory of the capsule endoscope receiver is sending to the PC by using the software.
Recording	The picture is taken by the capsule endoscope and sent to the capsule endoscope receiver through the receiving pad..

Note : The worst operating condition of the test sample was found out by preliminary investigation in varying resolution mode which recommended manufacturer . And, the final measurement was performed at the resolution above listed.

2.5 Test Configurations:

Mode #	Description
Download	The capsule endoscope receiver was connected to the charger. Also the capsule endoscope receiver was connected to the PC through the USB cable and then sent the picture to the PC by using software continuously.
Recording	The capsule endoscope was connected to the capsule endoscope receiver through the body simulation fixture and then took the picture and sent the picture to the capsule endoscope receiver continuously.

3 Test Conditions and Results – Conducted Emission

TEST: Limits of conducted emission								
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.							
Test Environment								
Parameters recorded during the test	Laboratory Ambient Temperature		21°C					
	Relative Humidity		46 %					
	Frequency range on each side of line		Measurement Point					
Fully configured sample scanned over the following frequency range	150kHz to 30MHz		Mains					
Limits - Class A								
Frequency (MHz)	Limit (dB μ V)							
	Quasi-Peak	Result	Average	Result				
0.15 to 0.50	79	-	66	-				
0.50 to 30	73	-	60	-				
Limits - Class B								
Frequency (MHz)	Limit (dB μ V)							
	Quasi-Peak	Result	Average	Result				
0.15 to 0.50	66 to 56	Pass	56 to 46	Pass				
0.50 to 5	56	Pass	46	Pass				
5 to 30	60	Pass	50	Pass				
Supplementary information: -. Not applicable for Recording mode due to internal battery operation								

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
LISN	Schwarzbeck	NNLA8120A	8120161	2008.02.29	2009.02.28
LISN	Schwarzbeck	ESH3-Z5	838979/010	2008.02.29	2009.02.28
TEST Receive	Rohde & Schwarz	ESPI7	100185	2008.08.27	2009.08.27
Pulse Limiter	Rohde & Schwarz	ESH3Z2	NONE	2008.09.10	2009.09.10

Table 1. Test data for conducted emission: Download mode

Test Frequency (MHz)	Correction Factor		Reading value(dBuV)		Line	Level(dBuV)		Limit (dBuV)		Margin (dB)	
	Cable	LISN	QP	AV		QP	AV	QP	AV	QP	AV
0.19	0.2	0.17	41.58	37.92	H	41.98	38.32	64.04	54.04	22.06	15.72
0.20	0.2	0.17	43.38	36.72	N	43.78	37.12	63.82	53.82	20.04	16.70
0.25	0.2	0.19	35.97	34.15	N	36.39	34.57	61.63	51.63	25.23	17.05
0.26	0.2	0.19	39.36	37.09	N	39.78	37.51	61.50	51.50	21.71	13.98
0.32	0.2	0.21	33.70	28.50	H	34.15	28.95	59.68	49.68	25.53	20.73
0.65	0.4	0.20	29.71	21.74	N	30.29	22.32	56.00	46.00	25.71	23.68
0.84	0.4	0.20	28.30	24.80	H	28.92	25.42	56.00	46.00	27.08	20.58
0.97	0.5	0.18	28.99	26.39	N	29.66	27.06	56.00	46.00	26.34	18.94
1.03	0.5	0.18	29.24	26.79	H	29.93	27.48	56.00	46.00	26.07	18.52
4.21	0.6	0.30	33.58	24.26	H	34.45	25.13	56.00	46.00	21.55	20.87
5.98	0.7	0.40	30.07	20.89	H	31.16	21.98	60.00	50.00	28.84	28.02
8.94	0.8	0.49	30.29	23.66	H	31.63	25.00	60.00	50.00	28.37	25.00
9.20	0.9	0.49	30.93	23.59	N	32.28	24.94	60.00	50.00	27.72	25.06
9.52	0.9	0.50	30.64	24.95	H	32.01	26.32	60.00	50.00	27.99	23.68
30.00	1.5	0.99	35.70	35.75	H	38.17	38.22	60.00	50.00	21.83	11.78

Table 2. Test data for conducted emission: Recording mode

Test Frequency (MHz)	Correction Factor		Reading value(dBuV)		Line	Level(dBuV)		Limit (dBuV)		Margin (dB)	
	Cable	LISN	QP	AV		QP	AV	QP	AV	QP	AV
0.20	0.2	0.17	43.71	37.59	H	44.11	37.99	63.82	53.82	19.71	15.83
0.25	0.2	0.19	34.39	34.27	H	34.81	34.69	61.66	51.66	26.85	16.97
0.26	0.2	0.19	38.90	36.69	N	39.32	37.11	61.46	51.46	22.14	14.35
0.32	0.2	0.21	32.43	28.24	N	32.88	28.69	59.60	49.60	26.72	20.91
0.33	0.2	0.21	30.74	28.14	H	31.20	28.60	59.55	49.55	28.36	20.96
0.39	0.3	0.21	30.24	26.67	N	30.73	27.16	58.15	48.15	27.42	20.99
0.52	0.4	0.20	28.88	27.36	N	29.44	27.92	56.00	46.00	26.56	18.08
0.90	0.5	0.19	28.70	26.18	H	29.35	26.83	56.00	46.00	26.65	19.17
0.97	0.5	0.18	28.92	25.75	N	29.59	26.42	56.00	46.00	26.41	19.58
1.48	0.5	0.20	29.35	27.35	H	30.02	28.02	56.00	46.00	25.98	17.98
4.22	0.6	0.30	43.21	17.81	H	44.08	18.68	56.00	46.00	11.92	27.32
5.85	0.7	0.39	29.72	25.06	H	30.79	26.13	60.00	50.00	29.21	23.87
6.95	0.8	0.48	29.39	22.60	H	30.62	23.83	60.00	50.00	29.38	26.17
7.60	0.8	0.48	29.39	27.49	N	30.66	28.76	60.00	50.00	29.34	21.24
8.43	0.8	0.49	31.24	21.48	H	32.55	22.79	60.00	50.00	27.45	27.21
9.52	0.9	0.50	29.52	18.34	N	30.89	19.71	60.00	50.00	29.11	30.29
30.00	1.5	0.99	38.25	38.29	H	40.72	40.76	60.00	50.00	19.28	9.24

Project Number:
Model Number:

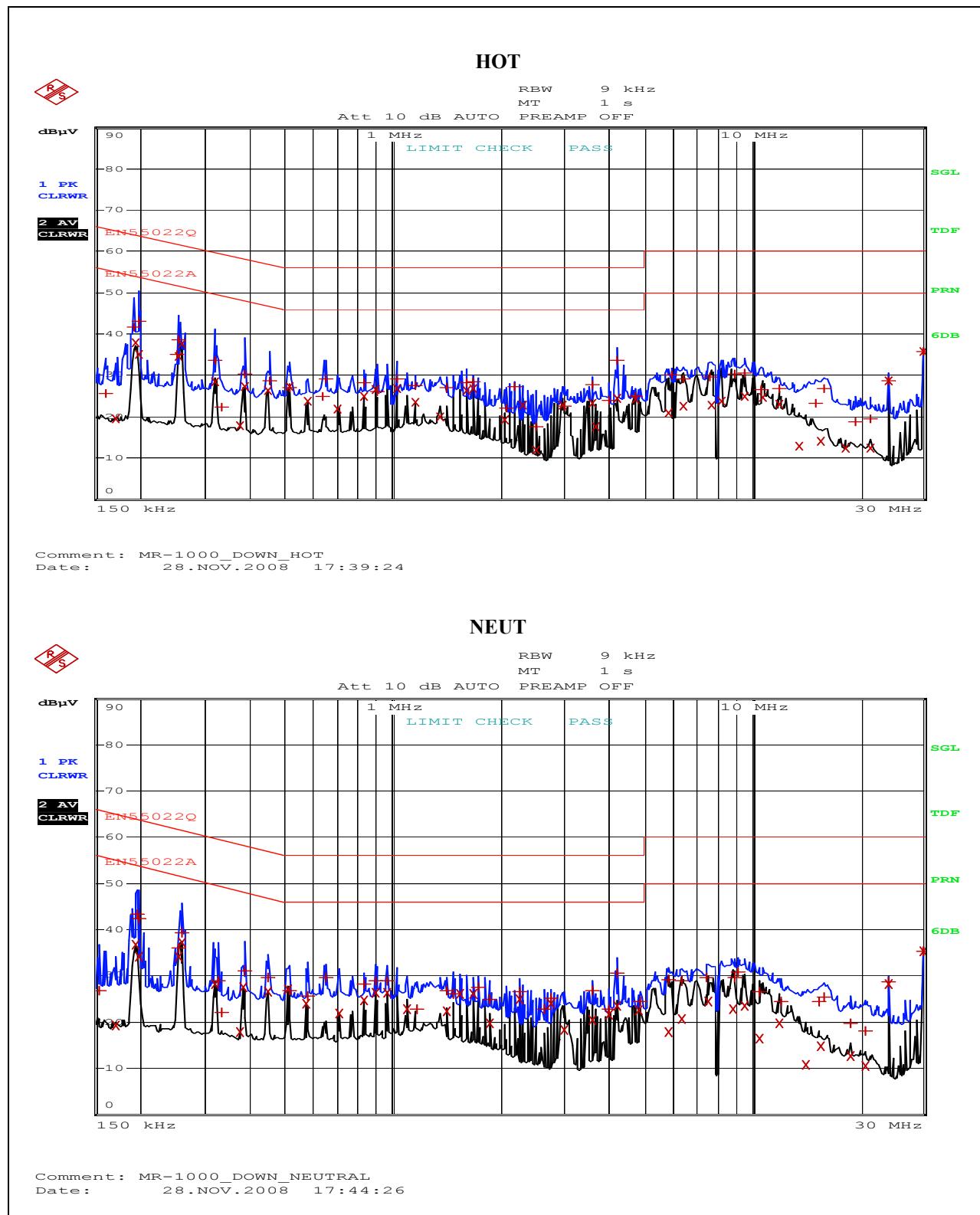
08CA53110
MicoCam Capsule Endoscope System

File Number

TC8340

Date of Issue :
December 22, 2008

Figure 1. Graphical representation of conducted emissions_Download mode

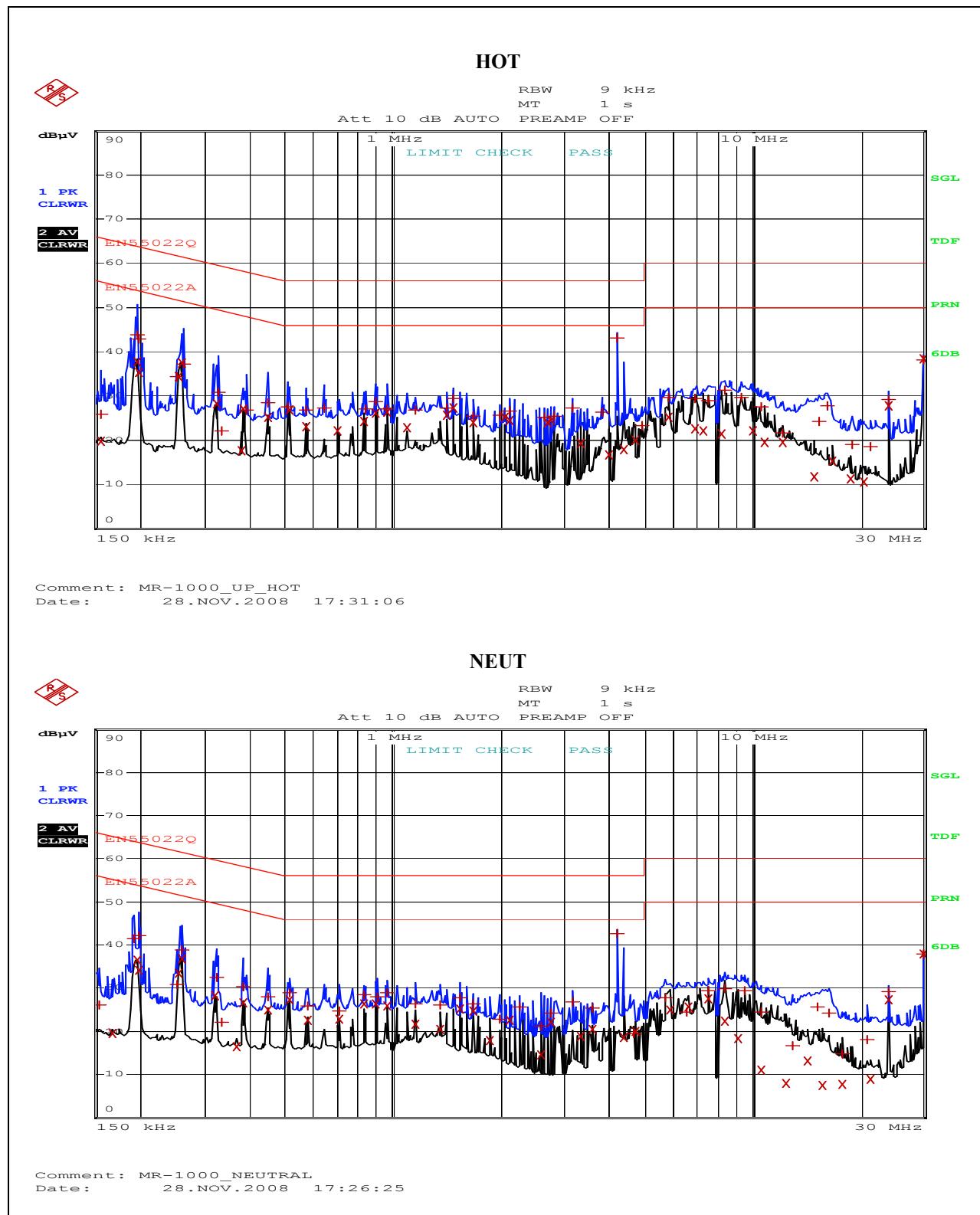


Project Number: 08CA53110
Model Number: MicoCam Capsule Endoscope System

File Number TC8340

Date of Issue : December 22, 2008

Figure 2. Graphical representation of conducted emissions_Download mode



4 Test Conditions and Results – Radiated Emission

TEST: Limits for radiated disturbance		
Method	Measurements were made at 10-meter open site that complies to CISPR 16/ANSI C63.4. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 3-meter. The EUT was rotated 360° about its azimuth with the receive antenna located at 1, 2, 3 and 4 meter heights in both horizontal and vertical polarities. Final measurements (quasi-peak or average as noted) were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4-meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.	
Test Environment		
Parameters recorded during the test	Laboratory Ambient Temperature	10°C
	Relative Humidity	42 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(3 meter measurement distance)
Limits - Class B(3m)		
Frequency (MHz)	Limit (dB μ V/m)	
	Quasi-Peak	Results
30 to 88	40	PASS
88 to 216	43.5	PASS
216 to 960	46	PASS
Above 960	54	PASS

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	Rohde & Schwarz	ESVS10	838562/002	2008. 1. 24	2009. 1. 24
Spectrum Analyzer	ADVANTEST	R3261C	61720116	2008. 4. 22	2009. 4. 22
LogBicon Antenna	Schwarzbeck	VULB 9160	3142	2008. 5. 15	2009. 5. 15
Amplifier	HP	8447F	2805A02972	2008. 6. 26	2009. 6. 26
Turn Table	EMCO	2087	2129	N/A	N/A
Antenna Mast	EMCO	2070-01	9702-203	N/A	N/A
ANT Mast Controller	EMCO	2090	1535	N/A	N/A
Turn Table Controller	EMCO	2090	1535	N/A	N/A

Table 3: Test mode- Download mode

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarit y (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Level dBuV/m	Limit 1 dBuV/m	Margin (dB)
50.54	12.90	QP	V	177	1.0	1.1	12.46	26.46	40.0	-13.54
78.88	12.10	QP	H	76	4.0	1.4	8.33	21.79	40.0	-18.21
120.00	17.70	QP	V	84	1.0	1.8	11.18	30.64	43.5	-12.86
153.61	10.10	QP	H	90	4.0	2.0	12.74	24.85	43.5	-18.65
166.30	11.40	QP	V	270	1.0	2.1	12.21	25.76	43.5	-17.74
202.83	13.50	QP	H	100	4.0	2.3	9.77	25.62	43.5	-17.88
216.0	17.00	QP	V	140	1.0	2.5	10.22	29.71	43.5	-13.79
232.30	13.60	QP	H	98	2.8	2.6	10.79	27.01	46.0	-18.99
240.00	21.50	QP	V	145	1.0	2.7	11.05	35.24	46.0	-10.76
288.01	15.90	QP	H	260	1.6	3.1	12.58	31.58	46.0	-14.42
360.00	16.80	QP	V	78	1.4	3.7	14.23	34.72	46.0	-11.28
404.96	13.60	QP	H	240	1.0	4.0	15.28	32.93	46.0	-13.07
480.01	13.80	QP	H	95	1.0	4.6	16.87	35.26	46.0	-10.74
720.01	7.50	QP	V	85	1.4	6.6	21.06	35.13	46.0	-10.87
960.01	9.40	QP	V	114	1.6	8.2	24.06	41.70	54.0	-12.30
Supplementary information:										
This table is to be use when Gain/Loss and Transducer Factors are provided separately.										

Table 4: Test mode- Recording mode

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarit y (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Level dBuV/m	Limit 1 dBuV/m	Margin (dB)
50.54	12.80	QP	V	170	1.0	1.1	12.46	26.36	40.0	-13.64
78.89	12.00	QP	H	68	4.0	1.4	8.33	21.69	40.0	-18.31
120.00	17.60	QP	V	59	1.0	1.8	11.18	30.54	43.5	-12.96
153.62	8.90	QP	H	95	2.4	2.0	12.74	23.65	43.5	-19.85
166.30	11.10	QP	V	78	1.0	2.1	12.21	25.46	43.5	-18.04
202.82	13.80	QP	H	98	1.5	2.3	9.77	25.92	43.5	-17.58
216.00	17.10	QP	V	65	1.0	2.5	10.22	29.81	43.5	-13.69
232.29	13.70	QP	H	185	1.4	2.6	10.79	27.11	46.0	-18.89
240.00	21.60	QP	V	137	1.0	2.7	11.05	35.34	46.0	-10.66
288.01	16.70	QP	H	175	1.0	3.1	12.58	32.38	46.0	-13.62
328.85	11.60	QP	V	144	1.3	3.5	13.58	28.64	46.0	-17.36
360.00	16.70	QP	V	167	1.5	3.7	14.23	34.62	46.0	-11.38
394.49	14.80	QP	V	52	1.6	4.0	15.01	33.78	46.0	-12.22
404.96	13.60	QP	H	100	1.0	4.0	15.28	32.93	46.0	-13.07
420.00	8.40	QP	V	37	1.0	4.2	15.70	28.30	46.0	-17.70
480.00	13.90	QP	H	165	1.0	4.6	16.87	35.36	46.0	-10.64
720.00	7.80	QP	V	151	1.6	6.6	21.06	35.43	46.0	-10.57
960.00	9.50	QP	V	217	1.4	8.2	24.06	41.80	46.0	-4.20
Supplementary information:										
This table is to be use when Gain/Loss and Transducer Factors are provided separately.										