



FCC EVALUATION REPORT FOR CERTIFICATION

Test Report No.: 07CA14033-FCC

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

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

Product Type: Capsule Endoscope & Receiver

Model Name: MiroCam Capsule Endoscope System

Multi-listing Model Name: NONE

FCC ID: VAXINTROMEDIC

Trade Name: MiroCam

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

FCC Classification: Class B Digital Device


FCC Procedure: Certification


Date of Receipt: 2007-04-18

Date of Test: 2007-04-18 ~ 2007-04-24

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

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Test Engineer: Jea Woon, Choi 
Project Engineer
Conformity Assessment Services - 3014ASEO
UL Korea Ltd.
March 20, 2007

Reviewed by Kyung Yong, Kim 
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UL Korea Ltd.
March 20, 2007

Project Number: 07CA14033 File Number MC15592
Model Number: MicoCam Capsule Endoscope System

Date of Issue :
May. 10, 2007

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: GUMI COLLEGE EMC Center (FCC Registration Number : 100749)
407, Bugok-Dong, Gumi, Gyungbuk 730-711, Korea

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

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Test Report Date: May 10, 2007

Product Type: Capsule Endoscope & Receiver

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

Model Name: MiroCam Capsule Endoscope System
(This system consists of the Capsule Endoscope Receiver Unit, MR
1000-R and Capsule Endoscope, MC1000)

Multi-listing Model name: N/A

Sample Serial Number: N/A

Sample Tag Number: N/A

Sample Receive Date: April 18, 2007

Testing Start Date: April 18, 2007

Date Testing Complete: April 24, 2007

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.

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1 Description of Test Facility

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Nose 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)

- GUMI EMC Laboratory-
- 407, Bugok-Dong, Gumi, Gyungbuk 730-711, Korea

1.1 Official Qualification(s)

MIC : 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℃	Operation Temperature : 20 ~ 40℃

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℃
Storage Temperature : 0 ~ 55℃	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 : JMW128KA0902FXX
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	Intromedic Co.,Ltd.	MC1000	EUT
o	Capsule Endoscope Receiver Set	Intromedic Co.	MR1000-R	EUT
o	AC/DC Adapter	AULT KOREA Corp	JMW128KA0902FXX	EUT
o	Test Fixture	Intromedic Co.	-	AE
o	Printer	Hewlett Packard	970CXI	N/A
o	Serial mouse	LOGITECH	M-S69	N/A
o	Notebook PC	COMPAQ	ARMADA E500	N/A
o	Printer	Hewlett Packard	970CXI	N/A
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	Mains	AC	1.80	Unshielded	Connected with Adapter
2	Adapter	DC	1.45	shielded	Connected with EUT
3	USB port	I/O	1.52	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.

2.6 Result Summary

Clause	Requirement – Test	Result	Verdict
15.107	Conducted emission	Met relevant limit	Complied
15.109	Radiated emission	Met relevant limit	Complied

3 Test Conditions and Results – Conducted Emission

1.5	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.				—
Parameters required prior to the test		Laboratory Ambient Temperature		10 to 40 °C	
		Relative Humidity		10 to 90 %	
Parameters recorded during the test		Laboratory Ambient Temperature		22°C	
		Relative Humidity		40%	
		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 (dBμV)				
	Quasi-Peak	Result	Average	Result	
0.15 to 0.50	79	-	66	-	
0.50 to 30	73	-	60	-	
Limits - Class B					
Frequency (MHz)	Limit (dBμV)				
	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	ESH2-Z5	829991/009	2006.12.09	2007.12.09
LISN	Schwarzbeck	ESH3-Z5	838979/020	2006.12.09	2007.12.09
TEST Receive	Rohde & Schwarz	ESCS30	839809/003	2006.11.27	2007.11.27

Figure 1 : Conducted Emission Test Setup



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
0.195	-0.22	0.12	39.9	20.1	L1	39.80	20.00	63.82	53.82	24.02	33.82
0.395	-0.12	0.13	37.8	20.0	L1	37.81	20.01	57.96	47.96	20.15	27.95
0.660	-0.23	0.14	38.7	21.1	L1	38.61	21.01	56.00	46.00	17.39	24.99
0.665	-0.23	0.14	39.2	21.5	L1	39.11	21.41	56.00	46.00	16.89	24.59
1.585	-0.28	0.15	33.4	16.5	L1	33.26	16.36	56.00	46.00	22.74	29.64
6.000	-0.18	0.21	49.3	47.3	L1	49.33	47.33	60.00	50.00	10.68	2.68
8.570	0.00	0.23	27.6	22.6	L1	27.83	22.83	60.00	50.00	32.17	27.17
12.000	0.00	0.31	32.9	29.9	L1	33.21	30.21	60.00	50.00	26.79	19.79
14.000	0.12	0.39	33.0	31.1	L1	33.51	31.61	60.00	50.00	26.49	18.39
16.000	0.00	0.50	26.2	25.0	L1	26.70	25.50	60.00	50.00	33.30	24.50
24.000	0.00	0.92	33.5	30.0	L1	34.42	30.92	60.00	50.00	25.58	19.08
30.000	0.13	0.97	30.1	27.4	L1	31.20	28.50	60.00	50.00	28.80	21.50

Figure 1. Test mode : Download mode (LIVE)

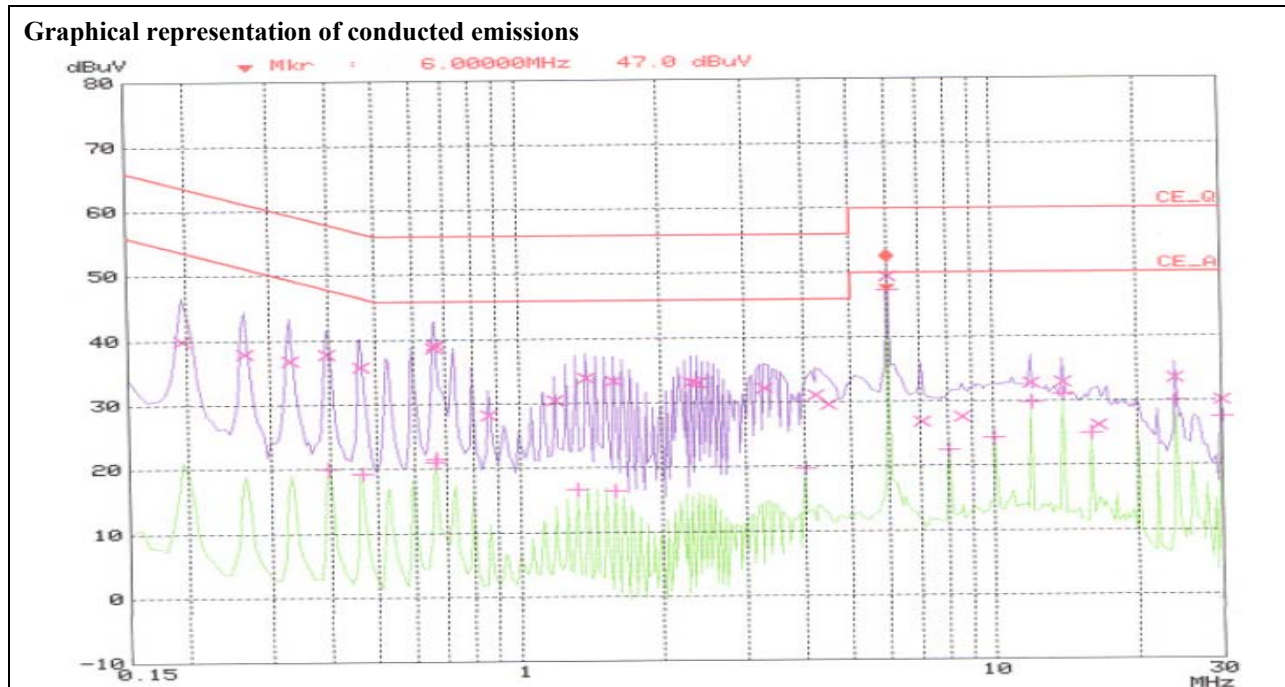
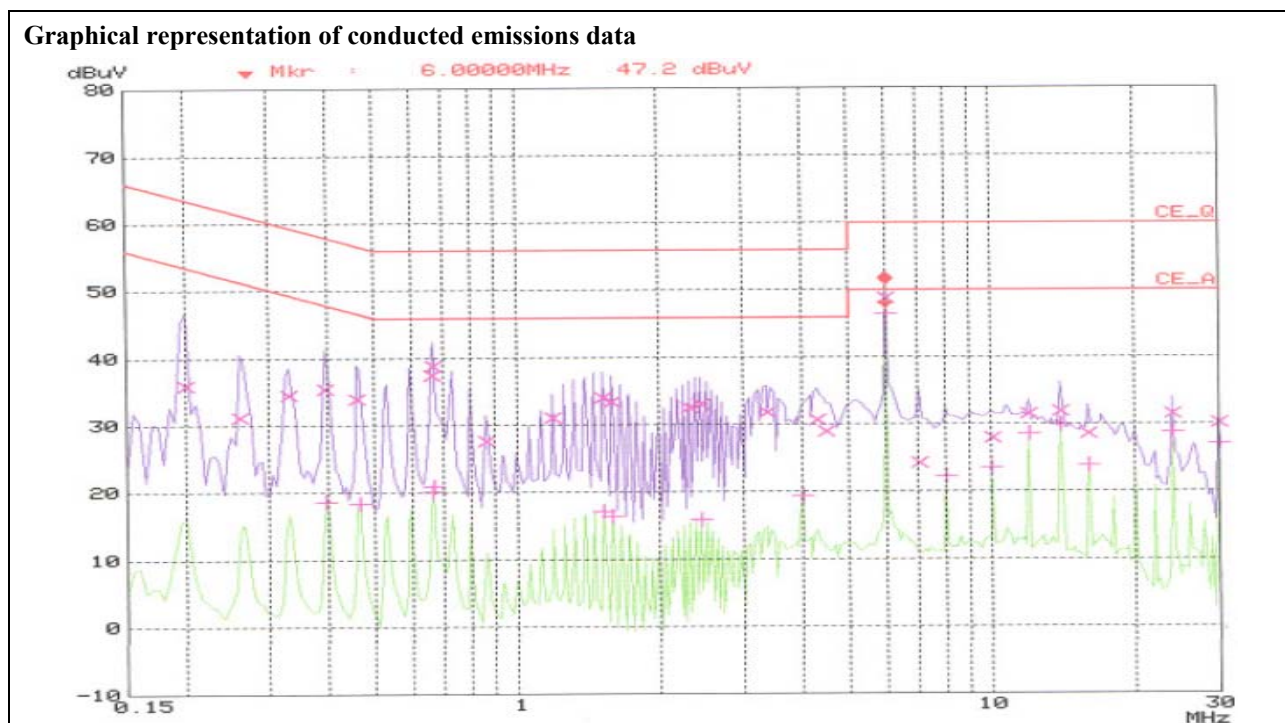


Figure 2 Test mode : Download mode (NENT)



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.		—
Parameters required prior to the test	Laboratory Ambient Temperature	10 to 40 °C	
	Relative Humidity	10 to 90 %	
Parameters recorded during the test	Laboratory Ambient Temperature	17°C	
	Relative Humidity	35%	
	Frequency range	Measurement Point	
Fully configured sample scanned over the following frequency range	30MHz – 1GHz	(3 meter measurement distance)	
Limits - Class A(10m)			
Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Results	
30 to 230	40	PASS	
230 to 1000	47	PASS	
Limits - Class B(10m)			
Frequency (MHz)	Limit (dBµV/m)		
	Quasi-Peak	Results	
30 to 230	30	PASS	
230 to 1000	37	PASS	

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Test Receiver	Rohde & Schwarz	ESI	830482/010	2006-12-14	2007-12-14
Test Receiver	Rohde & Schwarz	ESCS30	839809/003	2006-11-27	2007-11-27
Biconical ANT	Rohde & Schwarz	HK116	826 861/018	2006-11-27	2007-11-27
Log-Periodic ANT	Rohde & Schwarz	HL223	829 228/011	2006-11-27	2007-11-27
Position Controller	HD GmbH	HD100	100/692/01	N/A	
Turn Table	HD GmbH	DS415S	415/657/01	N/A	
Antenna Mast	HD GmbH	MA240	240/565/01	N/A	

Figure 13 : Photo of Radiated emission test setup(Download mode)



Figure 14 : Photo of Radiated emission test setup(Recording mode)



Table 5 :Test mode- Download mode

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Level dBuV/m	Limit 1 dBuV/m	Margin (dB)
159.91	9.8	QP	V	180	100	3.50	16.04	25.8	30.0	4.2
210.12	7.2	QP	V	124	128	4.02	18.29	25.5	30.0	4.5
213.36	7.1	QP	V	187	175	4.06	18.46	25.6	30.0	4.4
239.95	13.1	QP	V	100	195	4.38	19.75	32.8	37.0	4.2
319.98	13.7	QP	V	325	207	5.30	18.42	32.1	37.0	4.9
532.86	4.9	QP	V	52	130	6.86	24.86	29.8	37.0	7.2
624.01	1.2	QP	V	17	151	7.46	26.36	27.6	37.0	9.4
719.95	4.1	QP	V	0	137	8.02	27.77	32.9	37.0	4.1
Supplementary information: This table is to be use when Gain/Loss and Transducer Factors are provided separately.										

Table 6 : Test mode- Recording mode

Test Frequency (MHz)	Meter Reading (dBuV)	Detector (Pk/QP)	Polarity (V/H)	Azimuth (Degrees)	Antenna Height (cm)	Gain/Loss Factor (dB)	Transducer Factor (dB/m)	Level dBuV/m	Limit 1 dBuV/m	Margin (dB)
38.80	7.5	QP	H	0	350	1.80	13.04	20.5	30.0	9.5
60.01	11.2	QP	H	51	320	2.10	10.09	21.3	30.0	8.7
98.80	7.5	QP	V	100	157	2.69	12.35	19.9	30.0	10.1
207.16	4.3	QP	V	275	170	3.99	18.13	22.4	30.0	7.6
260.80	4.1	QP	V	90	150	4.63	20.89	25.0	37.0	12.0
480.00	1.8	QP	H	153	300	6.50	23.55	25.4	37.0	11.7
600.03	1.7	QP	H	160	259	7.40	25.64	27.3	37.0	9.7
891.24	0.9	QP	V	220	178	9.05	31.31	32.2	37.0	4.8
Supplementary information: This table is to be use when Gain/Loss and Transducer Factors are provided separately.										

5 EUT Modifications

Items	Description
#1	Added a clamp type two ferrite core(TDK/ACAT1730-0730) on the USB cable.
#2	Added a clamp type a ferrite core(TDK/ACAT1730-0730) on the Signal cable.
#3	Added a clamp type a ferrite core(TDK/ZCAT13250530) on the Adapter cable with one turn.
#4	Added 3 ground wire for the ground pattern reinforcement
#5	Added a capacitor (10uF) & bead on the charging ground pattern
#6	Added a capacitor (10uF) at charger board
#7	Added 4 capacitor (100pF) at charger board

