



Underwriters Laboratories Inc.

www.ul.com/emc

www.ulk.co.kr

Project: 11CA27209
File: TC8340
Report: 11CA27209-FCC
Date: May 13, 2011
Model: MiroCam Capsule Endoscope System
FCC ID: VAXINTROMEDIC3

FCC Evaluation Report for Certification

For

Capsule Endoscope & Receiver

INTROMEDIC CO., LTD.

SUITE 1104, 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:

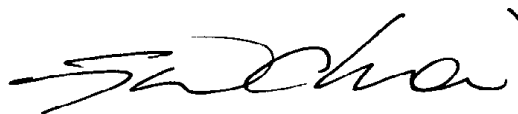
The tests listed in the Summary of Testing section of this report have been performed as a witness testing and the results recorded by UL Korea Ltd. in accordance with the procedures stated in each test requirement and specification. The test list was determined by the Applicant as being applicable to 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
Sung Hoon, Baek, Project Engineer
Conformity Assessment Services - 3014ASEO
UL Korea Ltd.
March 02, 2011



Reviewed by
Jeawoon, Choi, Senior Project Engineer
Conformity Assessment Services - 3014ASEO
UL Korea Ltd.
March 02, 2011

Project Number: 11CA27209 File Number TC8340
Model Number: MiroCam Capsule Endoscope System

Date of Issue :
May 13, 2011

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: EMC Compliance Ltd.
480-5 Sin-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do,
443-390, Korea

Tests Performed For: INTROMEDIC CO., LTD
SUITE 1104, E&C VENTURE DREAM TOWER 6-CHA
197-28 GURO-DONG, GURO-GU, SEOUL, KOREA

Applicant Contact: Jinyoung, Lee
Title: Deputy General Manager
Phone: +82-2-801-9386
Fax: +82-2-801-9330
E-mail: jylee@intromedic.com

Test Report Date: 2011-05-13

Product Type: Capsule Endoscope & Receiver

Trade Name: MiroCam

Model Name: MiroCam Capsule Endoscope System

FCC ID: VAXINTROMEDIC3

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

FCC Classification: Class B Digital Device

FCC Procedure: Certification

Sample Receive Date: 2011-04-19

Testing Start Date: 2011-04-24

Date Testing Complete: 2011-05-02

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	13

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)

- EMC Compliance Ltd.
- 480-5 Sin-dong, Yeongtong-gu, Suwon-city, Gyeonggi-do, 443-390, Korea

1.1 Official Qualification(s)

KCC : Granted Accreditation from Ministry of Information & Communication for EMC, Safety and Telecommunication
December 16, 2009 (Designation: KR0040)

FCC : Details of the measurement facilities used for these tests have been filed with the Federal Communications Commission's Laboratory in Columbia, Maryland and accepted in a letter dated.
April 01, 2005 (FCC CAB: KR0040)

VCCI : Accepted as an Associate Member to the VCCI. The measurement facilities detailed in this test
(VCCI Registration No.: R-3327, G-198, C-3706, T-1849)

KOLAS : Accredited by Korea Laboratory Accreditation Scheme (KOLAS) as Testing Laboratory in accordance with the provisions of Article 23 of the National Standards Act. These criteria encompass the requirements of
ISO/IEC 17025:2000. (KOLAS No.: 231)

Industry of Canada : Accredited by Industry Canada for performance of radiated measurements.
(Industry Canada Registration No.: 8035A)

2 Equipment Description

The Equipment Under Test (EUT) is the INTROMEDIC CO., LTD.

Capsule Endoscope & Receiver (Model No.: MiroCam Capsule Endoscope System)

Capsule Endoscope : MC 1000	
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 : MR 1100	
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 : 215	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, Title 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 : MR 1000-C	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
1	Capsule Endoscope & Receiver	INTROMEDIC	MiroCam Capsule Endoscope System	EUT
2	Ultra Low Power 802.11 b/g/n Module	Redpine Signals Inc	RS9110-N-11-02	EUT(FCC ID:XF6-RS9110N1102)
3	Headset	inkel	ES-304	AE
4	Printer	HP	MY04417243	AE
5	USB Mouse	Microsoft	MSK-1088	AE
6	Note PC	SAMSUNG	NT-R71	AE
7	JIG	-	-	AE
8	iPad	A1219	Apple	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	Cradle power input	AC	1.6	Unshielded	Connected with Adapter
2	USB	I/O	0.8	Shielded	Connected with Note PC
3	Data	I/O	0.5	Shielded	Connected with Note JIG
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
	3.6Vdc	0.40	-	-	-	Battery of Capsule Endoscope Receiver Unit

2.4 EUT Operation Modes & Configurations

Mode #	Description
Uploading mode	The test was conducted by using the program which was provided by manufacturer
Wireless mode	Wireless real-time view mode.
Telecom mode	Telecom mode real-time view mode.

2.5 Test Configurations:

Mode #	Description
Uploading mode	The test was conducted by using the program which was provided by manufacturer
Wireless mode	Wireless real-time view mode.
Telecom mode	Telecom mode real-time view mode.

3 Test Conditions and Results – Conducted Emission

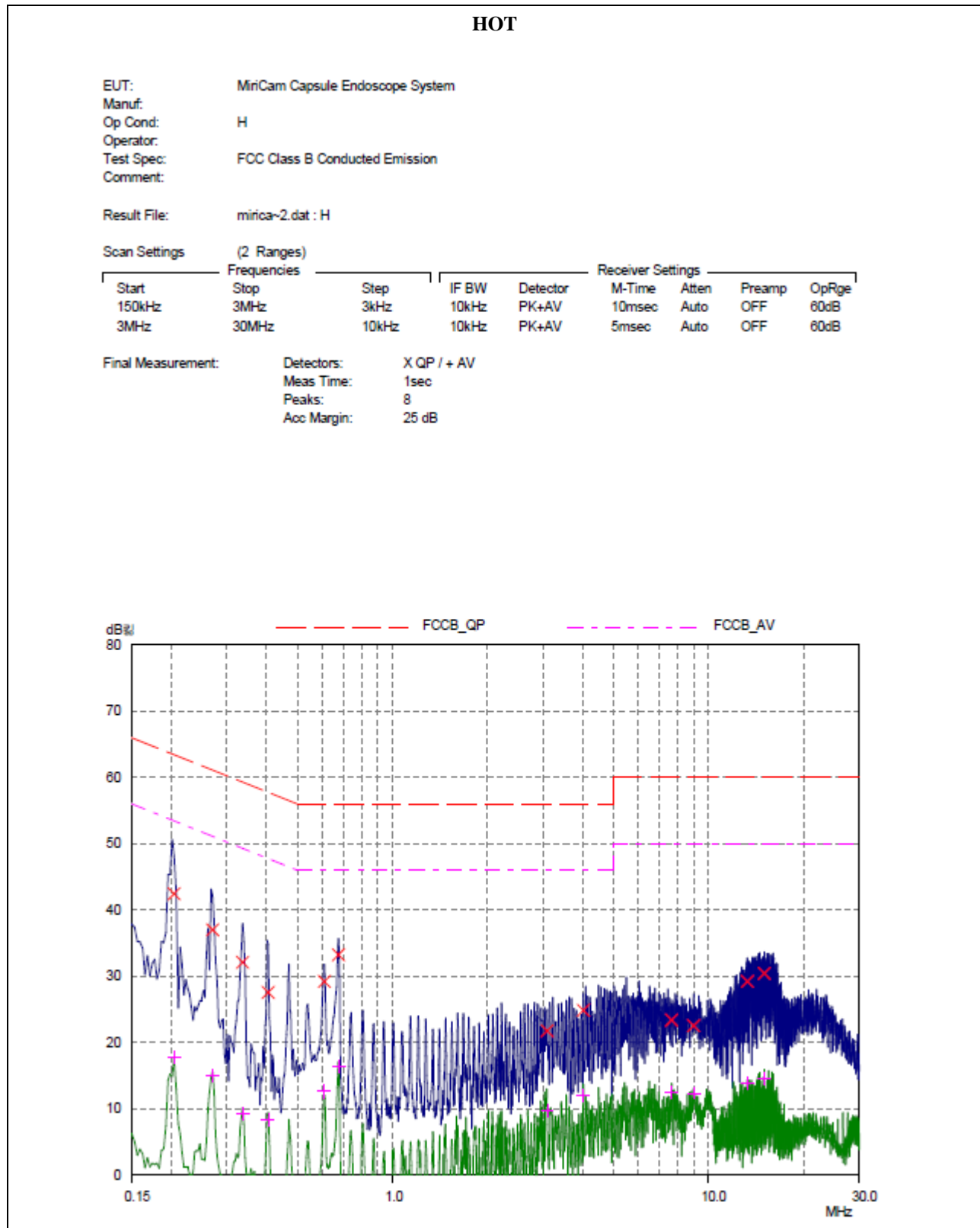
TEST: Limits of conducted emission				
Method	Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			
Test Environment				
Parameters recorded during the test		Laboratory Ambient Temperature		21.0 °C
		Relative Humidity		33.0 %
		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
Test Receiver	R&S	ESHS30	844827/011	2010.08.16	2011.08.16
LISN	R&S	ESH3-Z5	846125/024	2010.08.04	2011.08.04
LISN	PMM	L3-32	0120J20305	-	-

Table 1. Test data for conducted emission: Download mode (Uploading 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
0.198	0.07	0.02	42.63	17.34	N	42.72	17.43	63.69	53.69	20.97	36.26
0.204	0.09	0.02	42.45	17.75	H	42.56	17.86	63.45	53.45	20.89	35.59
0.270	0.09	0.02	37.01	15.05	H	37.12	15.16	61.12	51.12	24.00	35.96
0.336	0.09	0.03	32.10	9.29	H	32.22	9.41	59.30	49.30	27.08	39.89
0.405	0.08	0.02	27.58	8.33	H	27.68	8.43	57.75	47.75	30.07	39.32
0.609	0.08	0.03	29.25	12.68	N	29.36	12.79	56.00	46.00	26.64	33.21
0.675	0.08	0.03	33.30	16.45	N	33.41	16.56	56.00	46.00	22.59	29.44
3.090	0.11	0.04	21.76	9.82	H	21.91	9.97	56.00	46.00	34.09	36.03
3.150	0.11	0.04	23.65	11.05	N	23.80	11.20	56.00	46.00	32.20	34.80
4.020	0.12	0.05	24.86	12.04	H	25.03	12.21	56.00	46.00	30.97	33.79
4.490	0.12	0.05	25.46	12.09	N	25.63	12.26	56.00	46.00	30.37	33.74
5.560	0.21	0.06	24.75	11.75	N	25.02	12.02	60.00	50.00	34.98	37.98
6.630	0.23	0.06	23.94	12.81	N	24.23	13.10	60.00	50.00	35.77	36.90
7.640	0.26	0.07	23.39	12.41	H	23.72	12.74	60.00	50.00	36.28	37.26
13.270	0.40	0.08	29.21	13.75	H	29.69	14.23	60.00	50.00	30.31	35.77
14.470	0.34	0.08	29.15	13.75	N	29.57	14.17	60.00	50.00	30.43	35.83
15.010	0.43	0.09	30.43	14.55	H	30.95	15.07	60.00	50.00	29.05	34.93
Note: 1. Margin (dB)= Limit (dBuV) - Level (dBuV) 2. If no frequencies are specified in the tables, no measurement for quasi-peak or average was necessary.											

Figure 1. Graphical representation of conducted emissions_ Uploading mode



NEUT

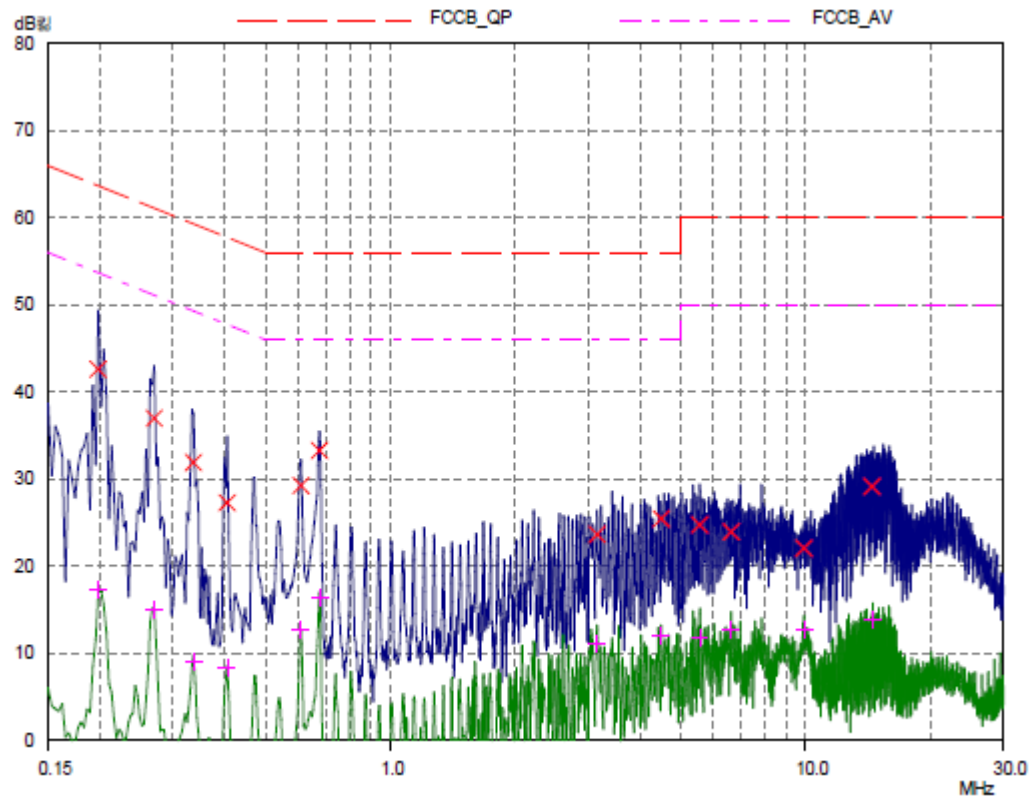
EUT: MiniCam Capsule Endoscope System
Manuf:
Op Cond: N
Operator:
Test Spec: FCC Class B Conducted Emission
Comment:

Result File: mirica-1.dat : N

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150kHz	3MHz	3kHz	10kHz	PK+AV	10msec	Auto	OFF	60dB
3MHz	30MHz	10kHz	10kHz	PK+AV	5msec	Auto	OFF	60dB

Final Measurement: Detectors: X QP / + AV
Meas Time: 1sec
Peaks: 8
Acc Margin: 25 dB



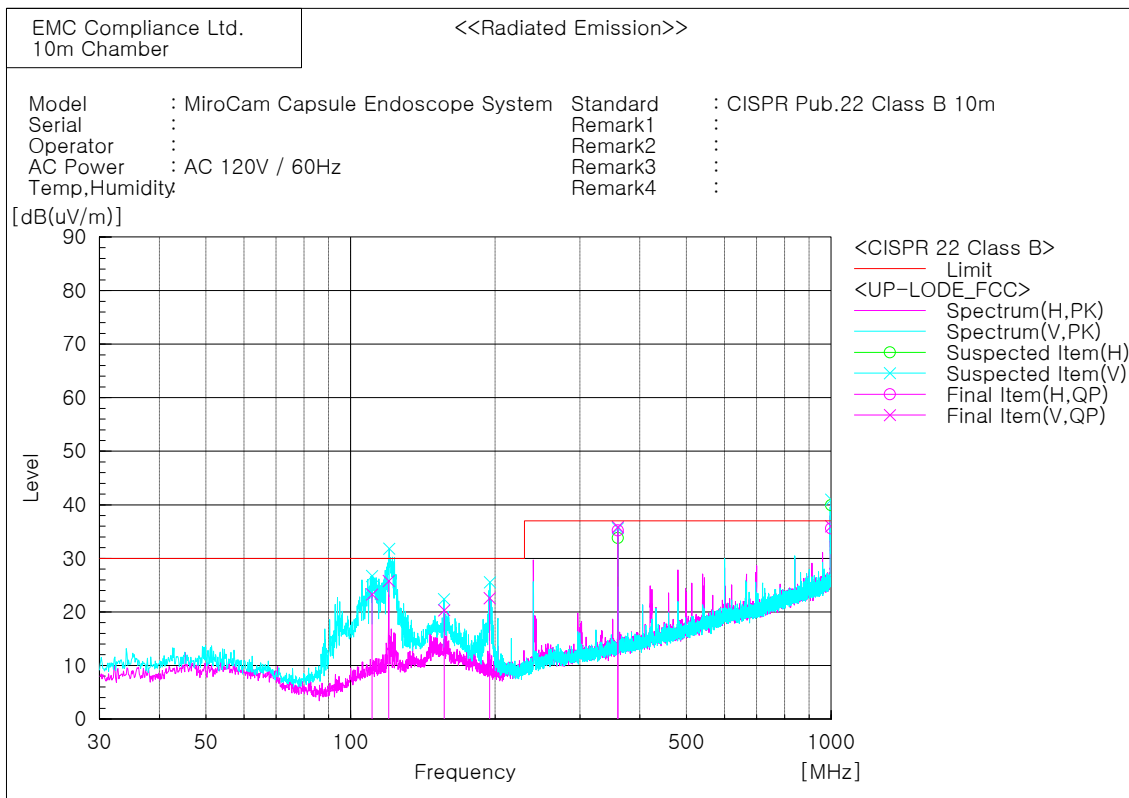
4. Test Conditions and Results – Radiated Emission

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	22.0°C
	Relative Humidity	30.0 %
	Frequency range	Measurement Point
Fully configured sample scanned over the following frequency range	30MHz – 1GHz 1MHz – 2GHz	10, 3 meter measurement distance
Limits - Class B(3m)		
Frequency (MHz)	Limit (dBμV/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	R&S	ESCI	100710	2010.12.01	2011.12.01
Bi-Log Antenna	SCHWARZBECK	VULB 9160	3228	2011.09.13	2012.09.13
Amplifier	SONOMA INSTRUMENT	310N	293004	2010.12.01	2011.12.01
3 dB Attenuator	HP	8491A	27444	2010.11.30	2011.11.30
Antenna Mast	Innco Systems	MA4000-EP	303	-	-
Turn Table	Innco Systems	DT2000S-1t	079	-	-
Test Receiver	R&S	ESCI	100710	2010.12.01	2011.12.01
Amplifier	AGILENT	8449B	3008A01802	2010.05.14	2011.05.14
Horn ANT	ETS	3115	00086706	2010.12.22	2011.12.22

Table 2: Test mode- Uploading mode

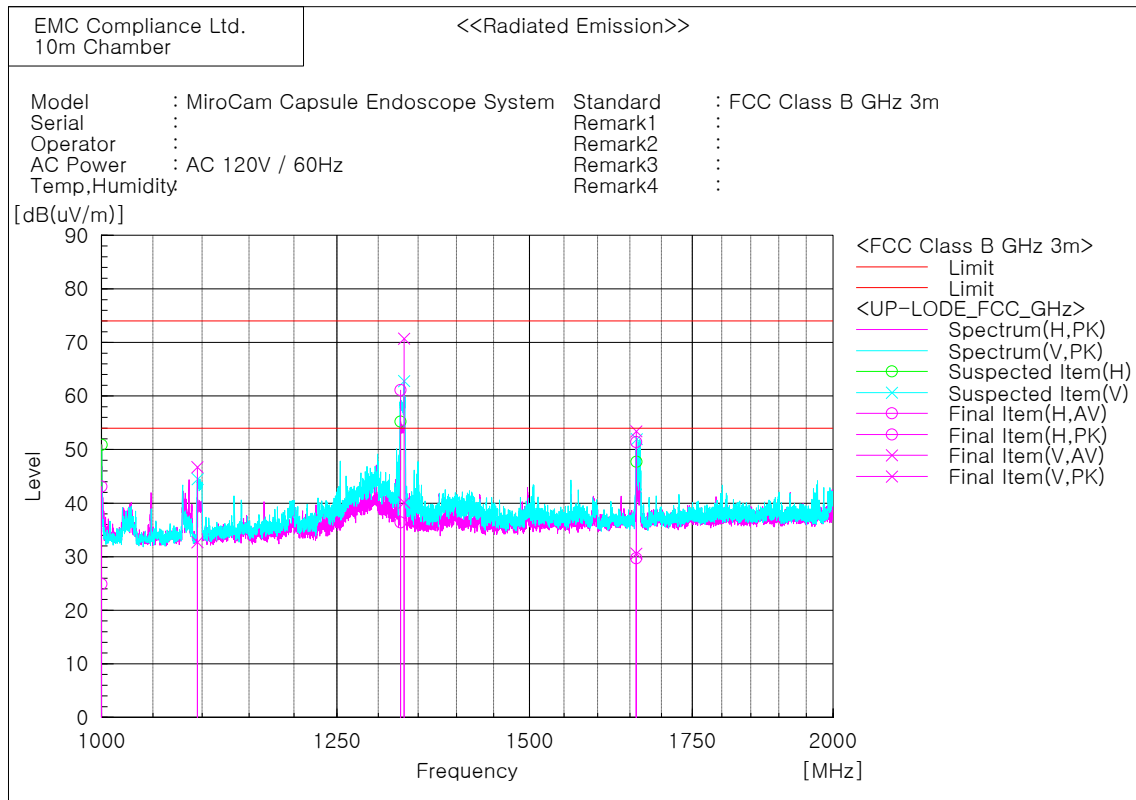
*** 30 MHZ - 1 GHZ**



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	110.715	V	40.8	-17.5	23.3	30.0	6.7	100.0	99.2
2	119.996	V	42.5	-16.7	25.8	30.0	4.2	199.0	62.5
3	156.489	V	35.1	-14.8	20.3	30.0	9.7	100.0	141.7
4	194.655	V	40.5	-17.9	22.6	30.0	7.4	100.0	99.2
5	359.999	V	48.2	-12.3	35.9	37.0	1.1	100.0	136.7
6	359.999	H	47.5	-12.3	35.2	37.0	1.8	301.0	302.7
7	999.600	H	35.1	0.5	35.6	37.0	1.4	101.0	357.8
8	999.655	V	35.5	0.5	36.0	37.0	1.0	199.0	107.5

* 1 GHZ - 2 GHZ

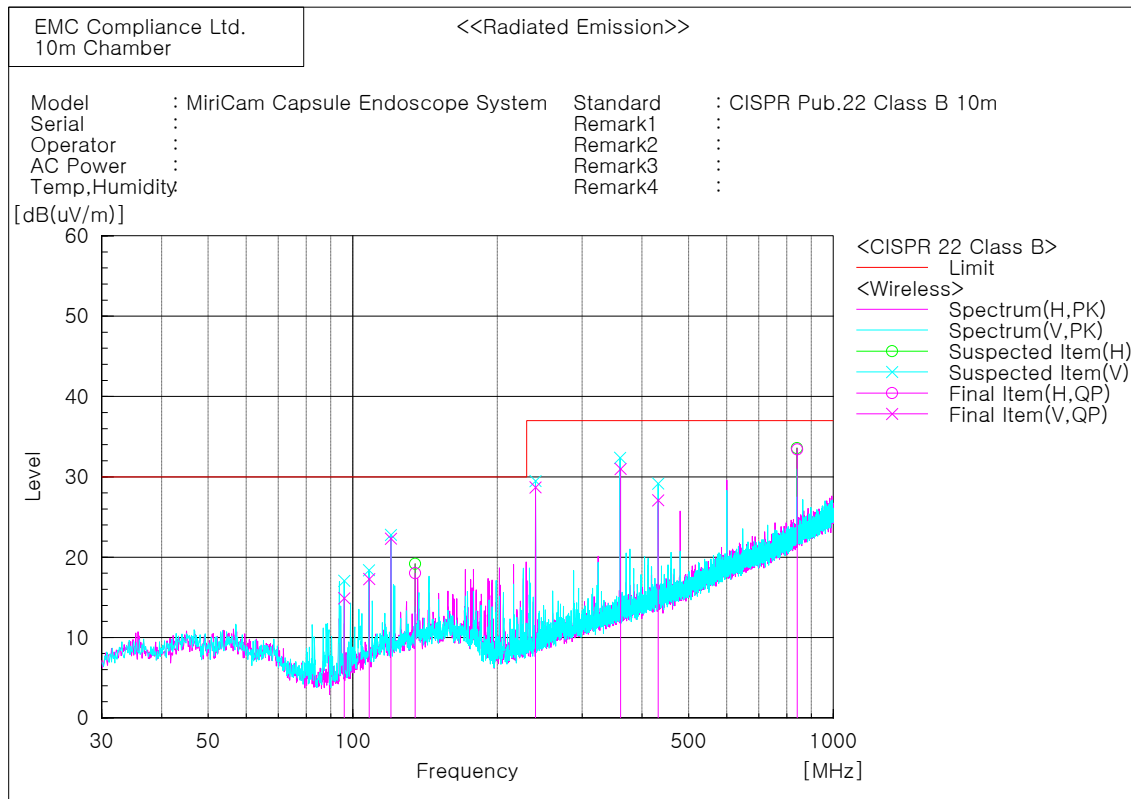


Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	c.f [dB(1/m)]	Result AV [dB(uV/m)]	Result PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]
1	1000.010	H	38.0	56.2	-13.1	24.9	43.1	54.0	74.0	29.1	30.9	100.0	37.7
2	1095.093	V	45.0	59.0	-12.3	32.7	46.7	54.0	74.0	21.3	27.3	100.0	266.7
3	1327.555	H	46.7	71.4	-10.3	36.4	61.1	54.0	74.0	17.6	12.9	201.0	352.0
4	1332.028	V	50.3	80.9	-10.2	40.1	70.7	54.0	74.0	13.9	3.3	100.0	11.3
5	1659.640	H	37.5	59.2	-7.8	29.7	51.4	54.0	74.0	24.3	22.6	100.0	160.4
6	1659.640	V	38.4	61.2	-7.8	30.6	53.4	54.0	74.0	23.4	20.6	100.0	54.4

Table 3: Test mode- Wireless mode

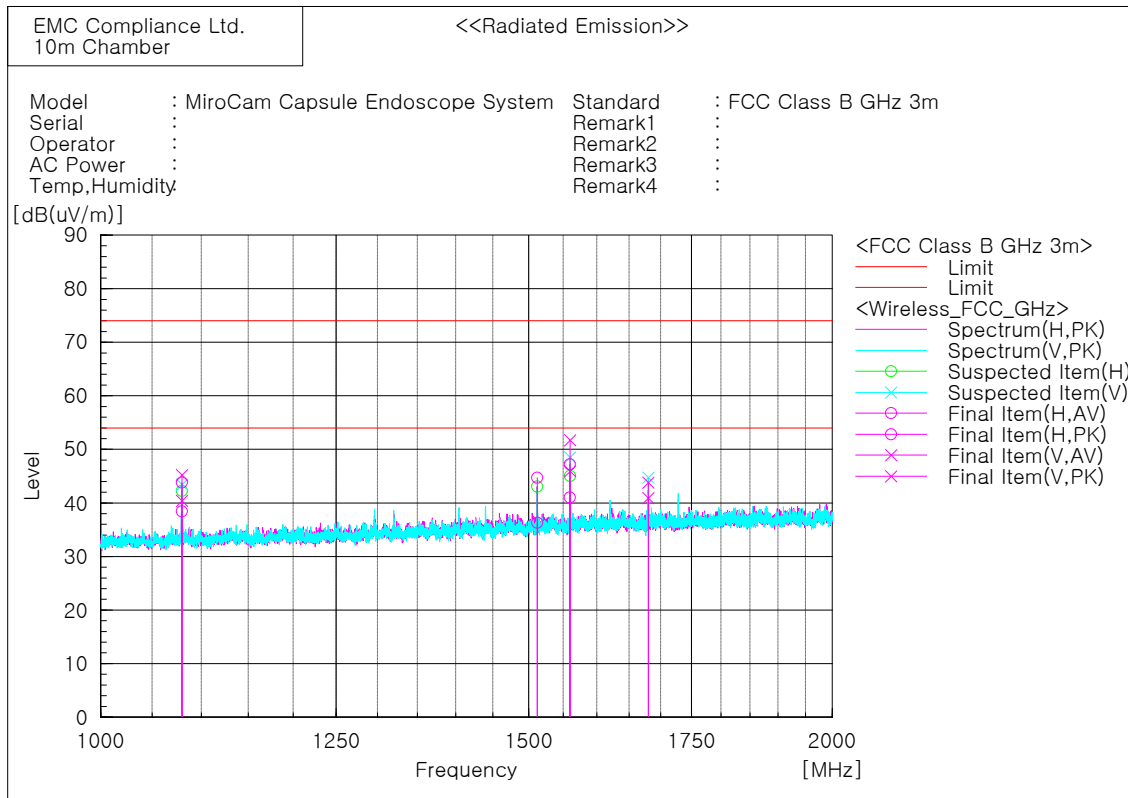
*** 30 MHZ - 1 GHZ**



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	95.955	V	35.1	-20.2	14.9	30.0	15.1	100.0	38.7
2	108.185	V	35.1	-17.8	17.3	30.0	12.7	201.0	64.4
3	120.040	V	39.0	-16.7	22.3	30.0	7.7	100.0	103.9
4	134.765	H	33.8	-15.8	18.0	30.0	12.0	400.0	11.0
5	240.000	V	45.1	-16.4	28.7	37.0	8.3	100.0	316.9
6	360.766	V	43.2	-12.2	31.0	37.0	6.0	100.0	176.6
7	432.054	V	37.8	-10.7	27.1	37.0	9.9	100.0	98.9
8	840.676	H	36.0	-2.6	33.4	37.0	3.6	100.0	35.2

* 1 GHZ - 2 GHZ

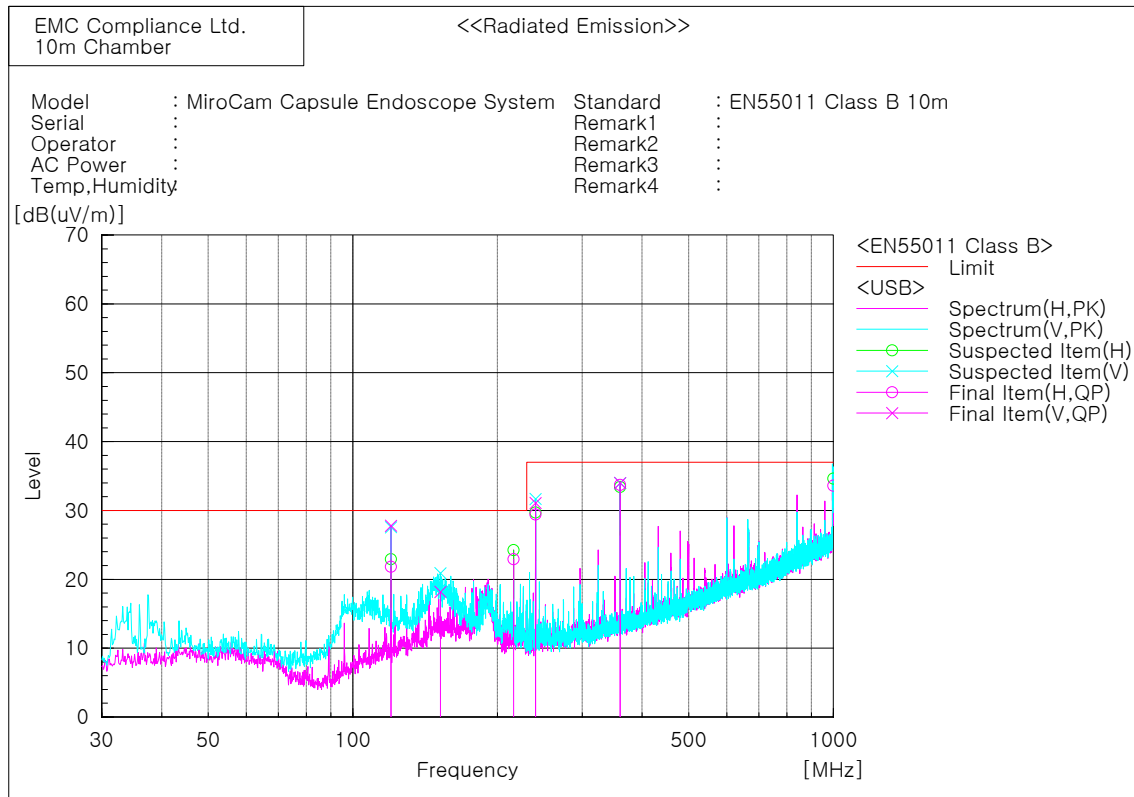


Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	c.f [dB(1/m)]	Result AV [dB(uV/m)]	Result PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]
1	1080.055	V	52.8	57.6	-12.4	40.4	45.2	54.0	74.0	13.6	28.8	100.0	170.0
2	1080.055	H	50.8	56.2	-12.4	38.4	43.8	54.0	74.0	15.6	30.2	201.0	146.0
3	1512.255	H	45.1	53.5	-8.8	36.3	44.7	54.0	74.0	17.7	29.3	100.0	165.3
4	1559.855	H	49.5	55.7	-8.5	41.0	47.2	54.0	74.0	13.0	26.8	100.0	160.3
5	1560.055	V	54.4	60.2	-8.5	45.9	51.7	54.0	74.0	8.1	22.3	100.0	157.5
6	1680.157	V	48.6	51.5	-7.7	40.9	43.8	54.0	74.0	13.1	30.2	100.0	130.0

Table 4: Test mode- Telecom mode

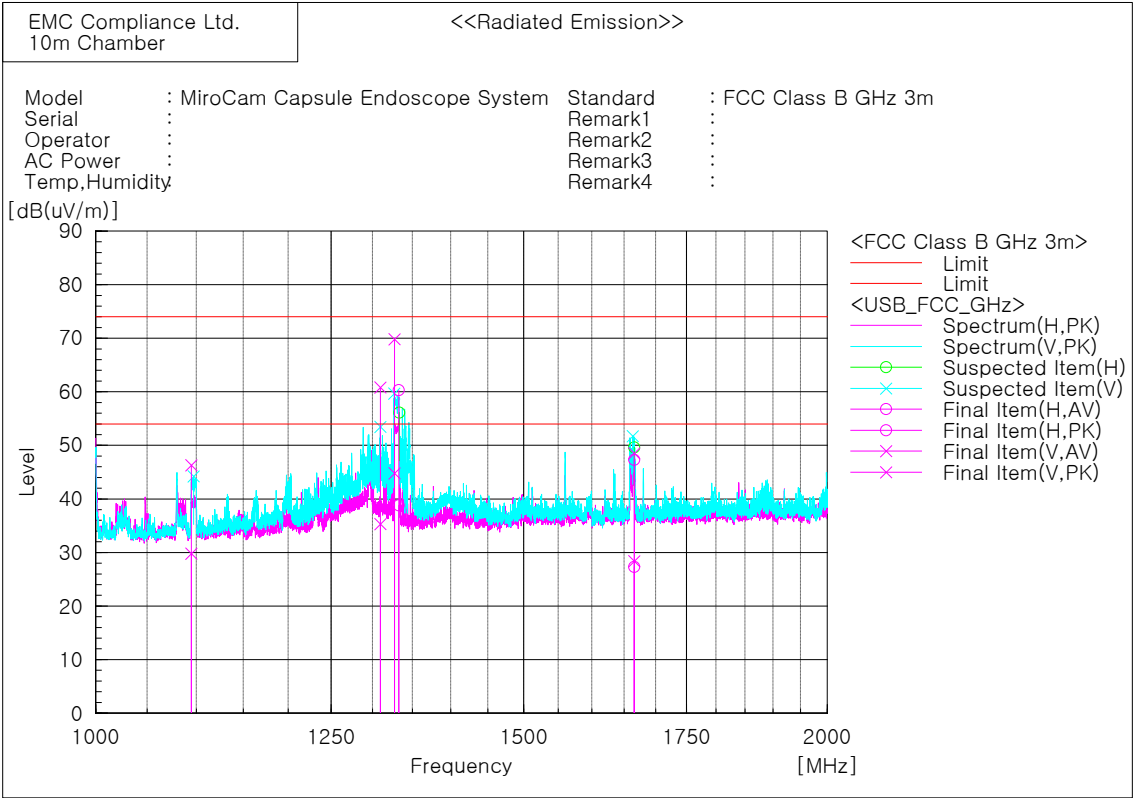
*** 30 MHz - 1 GHz**



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]
1	120.001	H	38.5	-16.7	21.8	30.0	8.2	400.0	314.8
2	120.003	V	44.5	-16.7	27.8	30.0	2.2	199.0	64.9
3	152.165	V	33.1	-14.9	18.2	30.0	11.8	100.0	62.4
4	216.010	H	40.5	-17.6	22.9	30.0	7.1	300.0	298.9
5	240.050	V	47.5	-16.4	31.1	37.0	5.9	100.0	7.6
6	240.050	H	45.8	-16.4	29.4	37.0	7.6	300.0	178.6
7	359.999	V	46.3	-12.3	34.0	37.0	3.0	100.0	150.3
8	359.999	H	46.0	-12.3	33.7	37.0	3.3	300.0	298.9
9	999.677	H	33.1	0.5	33.6	37.0	3.4	100.0	291.2

* 1 GHZ - 2 GHZ



Final Result

No.	Frequency [MHz]	(P)	Reading AV [dB(uV)]	Reading PK [dB(uV)]	c.f [dB(1/m)]	Result AV [dB(uV/m)]	Result PK [dB(uV/m)]	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]	Height [cm]	Angle [deg]
1	1094.733	V	42.1	58.6	-12.3	29.8	46.3	54.0	74.0	24.2	27.7	100.0	256.6
2	1309.658	V	45.7	71.2	-10.4	35.3	60.8	54.0	74.0	18.7	13.2	100.0	350.3
3	1327.110	V	55.1	80.1	-10.3	44.8	69.8	54.0	74.0	9.2	4.2	100.0	301.6
4	1332.630	H	49.0	70.5	-10.2	38.8	60.3	54.0	74.0	15.2	13.7	100.0	11.8
5	1665.878	V	36.2	56.3	-7.8	28.4	48.5	54.0	74.0	25.6	25.5	201.0	66.0
6	1665.555	H	35.1	55.1	-7.8	27.3	47.3	54.0	74.0	26.7	26.7	100.0	161.5