FCC DoC
TEST REPORT

for

Ambu aScope Monitor

MODEL: TF-ONYX-A65-A1-1010

Test Report Number:
90312206-D

Issued to:

Ambu A/S
Rugmarken 10 DK-3650 Olstykke

Issued by:

Compliance Certification Services Inc.
Sindian BU.
No.163-1, Jhongsheng Rd., Sindian City,
Taipei County 23151, Taiwan
TEL: 886-2-22170894
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Issued Date: April 13, 2009

Revision History

Rev.		Issue Date		Revisions	Effect Page	Revised By
00				Initial Issue	ALL	

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1 TEST RESULT CERTIFICATION

Product:	Ambu aScope Monitor
Brand:	Ambu
Model:	TF-ONYX-A65-A1-1010
Applicant:	**Ambu A/S** Rugmarken 10 DK-3650 Olstykke
Manufacturer:	**Ambu A/S** Rugmarken 10 DK-3650 Olstykke
Tested:	March 13, 2009 & March 25, 2009

Applicable Standard	Class / Limit	Test Result
FCC Part 18	---	No non-compliance noted
Deviation from Applicable Standard		
None		

Note: *1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.*
2. The information of measurement uncertainty is available upon the customer's request.

Deviation from Applicable Standard
None

The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:

Vince Chiang
Assistant Manager of Sindian BU.

Reviewed by:

Vesta Hsu
Supervisor of report document dept. of Sindian BU.

2 EUT DESCRIPTION

Product	Ambu aScope Monitor
Trade Name	Ambu
Model	TF-ONYX-A65-A1-1010
Housing Type	Plastic
Identify Number	90312206
Received Date	March 12, 2009
EUT Power Rating	12VDC from Adaptor
AC Power During Test	120VAC / 60Hz to AC Adaptor
AC Adaptor Manufacturer	GlobTek, Inc.
AC Adaptor Model	GTM41060-2512
AC Adaptor Power During	I/P: 100-240VAC, 50-60Hz O/P: 12VDC
DC Power Cable Type	Unshielded, 1.8m (Non-detachable, with a core) to AC Adaptor
OSC/Clock Frequencies	24MHz; 27MHz; 14.31818MHz

I/O PORT OF EUT

I/O PORT TYPE	Q'TY	TESTED WITH
1). Endoscope Port	1	1

Note: *Client consigns only one model sample (Model Number is TF-ONYX-A65-A1-1010) to test.*

3 TEST METHODOLOGY

3.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ modes is as the following:

Conduction Mode:

1	**Normal Mode**

Radiation Mode:

1	**Normal Mode**
	Normal Mode / 1-2GHz

Conduction: Mode 1
Radiation: Mode 1

3.2. EUT SYSTEM OPERATION

1. All peripherals connect EUT to test.

Note: *Test program is self-repeating throughout the test.*

4 SETUP OF EQUIPMENT UNDER TEST

4.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

EUT Devices:

No.	Equipment	Model No.	Trade Name
1	CPU (216MHz)	TMS320DM355ZCE70	TEXAS INSTRUMENTS
2	Panel (6.5 TFT LCD CCFL 640X480 18bits)	LTA065B0D0F	Toshiba
3	Storage Memory (1GB 128MX8bits)	K9F1G08U0B	SAMSUNG
4	System Memory (DDR2-400MHz)	MT47H64M16HR-3	Micron
5	Software edition	SP065V4 0.7.0a	AAEON
6	Main Board	96970A6582-D REV.A0.3	AAEON
7	OSD Board	9697Y00200 REV.A0.1	AAEON
8	PWRKEY Board	9697Y02101-D REV.A0.1	AAEON
9	DC Jack Board	9697Y02300 REV.A0.1	AAEON
10	INVERTER	INV981	G-Sonic
11	Rechargeable Battery.Li-ion.7.4V.2100mAh.	9709004 REV.V0.1	FUCO

Peripherals Devices:

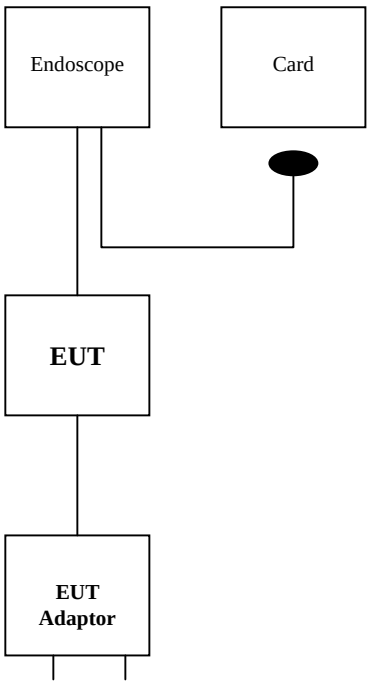
No.	Equipment	Model No.	Serial No.	FCC ID / BSMI ID	Trade Name	Data Cable	Power Cord
1	Endoscope	Ambu aScope	N/A	N/A	Ambu	Shielded, 1.95m	N/A

Note:

1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.

2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.2. CONFIGURATION OF SYSTEM UNDER TEST



5 FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at CCS Taiwan Sindian BU. at No.163-1, Jhongsheng Rd., Sindian City, Taipei County 23151, Taiwan.

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

5.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF
USA	A2LA

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV Rheinland
Japan	VCCI
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsemc.com

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Uncertainty
Conducted emissions	0.15MHz~30MHz	± 1.7376
Radiated emissions	30MHz ~ 200MHz	±3.9022
	200MHz ~1000MHz	± 3.9069

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Consistent with industry standard (e.g. CISPR 22: 2006, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

6 CONDUCTED EMISSION MEASUREMENT

6.1. LIMITS OF CONDUCTED EMISSION MEASUREMENT

Maximum permissible level of Line Conducted Emission

Frequency (MHZ)	(dBuV)	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:
(1) The lower limit shall apply at the transition frequencies.
(2) The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
(3) All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

6.2. TEST INSTRUMENTS

Conducted Emission Test Site # A				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	R&S	ESHS20	840455/006	02/12/2010
LISN (EUT)	SCHWARZBECK	NSLK 8127	8127382	12/09/2009
LISN	SOLAR	8012-50-R-24-BNC	8305114	12/09/2009
BNC CABLE	MIYAZAKI	5D-FB	BNC A4	05/12/2009
THERMO-HYGRO METER	TECPEL	DTM-303	No.7	11/24/2009
Test S/W	EMI 32.exe			

NOTE: *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.*
2. N.C.R = No Calibration Request.

6.3. TEST PROCEDURES (please refer to measurement standard or CCS SOP PA-031)

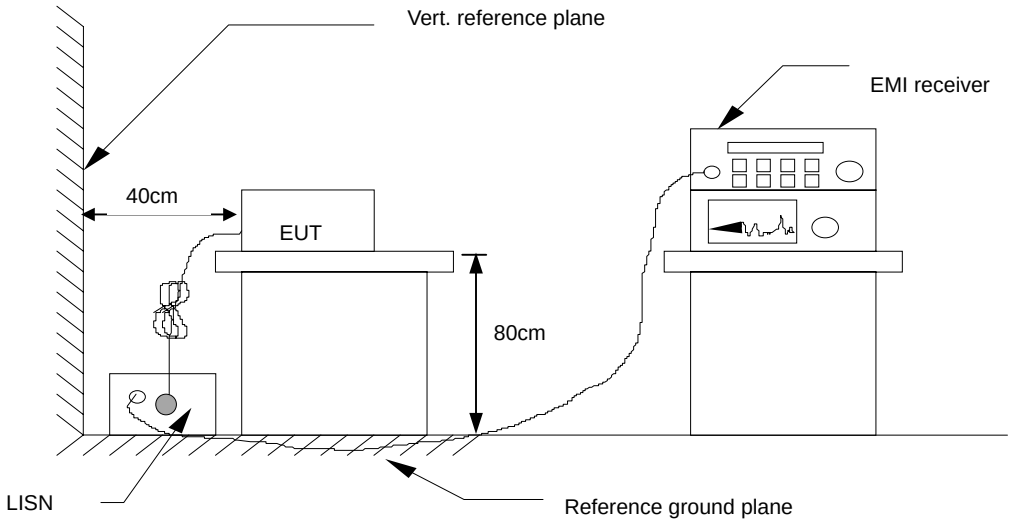
Procedure of Preliminary Test

- The EUT and Support equipment, if needed, was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 12 mm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- The test equipment EUT installed received AC main power, through a Line Impedance Stabilization Network (LISN), which supplied power source and was grounded to the ground plane.
- All support equipment power received from a second LISN.
- The EUT test program was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The EUT configuration and cable configuration of the above highest emission levels were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.

6.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.5. DATA SAMPLE

Freq. MHz	Read Level dBuV	Factor dB	Level dBuV	Limit dBuV	Over Limit dB	Remark (P/Q/A)	Line (L1/L2)
x.xx	42.95	0.55	43.50	56	-12.50	Q	L1

Freq. = Emission frequency in MHz
Read Level = Uncorrected Analyzer/Receiver reading
Factor = Insertion loss of LISN + Cable Loss
Level = Read Level + Factor
Limit = Limit stated in standard
Over Limit = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
L1 = Hot side
L2 = Neutral side

Calculation Formula

Over Limit (dB) = Level (dBuV) – Limit (dBuV)

6.6. TEST RESULTS

Model No.	TF-ONYX-A65-A1-1010	**6dB Bandwidth**	10 KHz
Environmental Conditions	25deg.C, 55% RH, 1010hPa	**Test Mode**	Mode 1
Tested by	Stanley Chang		

(The chart below shows the highest readings taken from the final data.)

Six Highest Conducted Emission Readings							
Frequency Range Investigated				**150 KHz to 30 MHz**			
Freq. (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV)	Limit Line (dBuV)	Over Limit (dB)	Remark (P/Q/A)	Line (L1/L2)
0.192	**42.79**	**0.07**	**42.86**	**63.93**	**-21.07**	**P**	**L1**
2.779	**39.98**	**0.20**	**40.18**	**56.00**	**-15.82**	**P**	**L1**
4.202	**40.61**	**0.27**	**40.88**	**56.00**	**-15.12**	**P**	**L1**
0.516	**38.31**	**0.09**	**38.40**	**56.00**	**-17.60**	**P**	**L2**
2.707	**43.49**	**0.18**	**43.67**	**56.00**	**-12.33**	**P**	**L2**
4.247	**40.95**	**0.23**	**41.19**	**56.00**	**-14.81**	**P**	**L2**

NOTE: *1. 0.15MHz to 30MHz test is Applicable Part 15.107 standard.*
2. The emission level was or more than 2dB below the Average limit, so no re-check anymore.

7 RADIATED EMISSION MEASUREMENT

7.1. LIMITS OF RADIATED EMISSION MEASUREMENT

Maximum permissible level of Radiated Emission measured at 3meter

Frequency (MHZ)	Maximum Field Strength Limit (dBu V/m/ Q.P.)
30-88	40
88-216	43.5
216-960	46
Above 960	53.9

Note: *The lower limit shall apply at the transition frequency.*

Frequency (MHz)	dBuV/m (At 3m)	
	Average	Peak
Above 960	54	74

NOTE: *(1) The lower limit shall apply at the transition frequencies.*
(2) Emission level (dBuV/m) = 20 log Emission level (uV/m).

7.2. TEST INSTRUMENTS

Open Area Test Site # J				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
MEASURE RECEIVER	SCHAFFNER	SCR3501	330	06/09/2009
SPECTRUM ANALYZER	ADVANTEST	R3132	120900002	No Calibration Required
ANTENNA	SCHAFFNER	CBL 6112B	2800	09/09/2009
PRE-AMPLIFIER	SCHAFFNER	CPA9231A	3629	10/12/2009
CABLE	BELDEN	9913	N-TYPE #J3	01/22/2010
THERMO-HYGRO METER	TECPEL	DTM-303	NO.3	11/24/2009
Test S/W	EZ-EMC			
Above 1GHz Used				
SPECTRUM ANALYZER (3Hz-44GHz)	Agilent	E4446A	MY48250064	10/28/2009
ANTENNA (1-18GHz)	EMCO	3115	00022256	01/22/2010
AMPLIFIER (1-18GHz)	HP	8449B	3008A01266	01/19/2010
CABLE (1-18GHz)	JYEBAO	LL142	SMA#RS1	01/19/2010
CABLE (1-18GHz)	HUBER +SUHNER	SUCOFLEX 104	SMA#RS3	01/19/2010
CABLE (1-18GHz)	JYEBAO	LL142	SMA#C1	01/19/2010
Test S/W	EZ-EMC			

NOTE: *1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.*

2. N.C.R = No Calibration Request.

7.3. TEST PROCEDURES (please refer to measurement standard or CCS SOP PA-031)

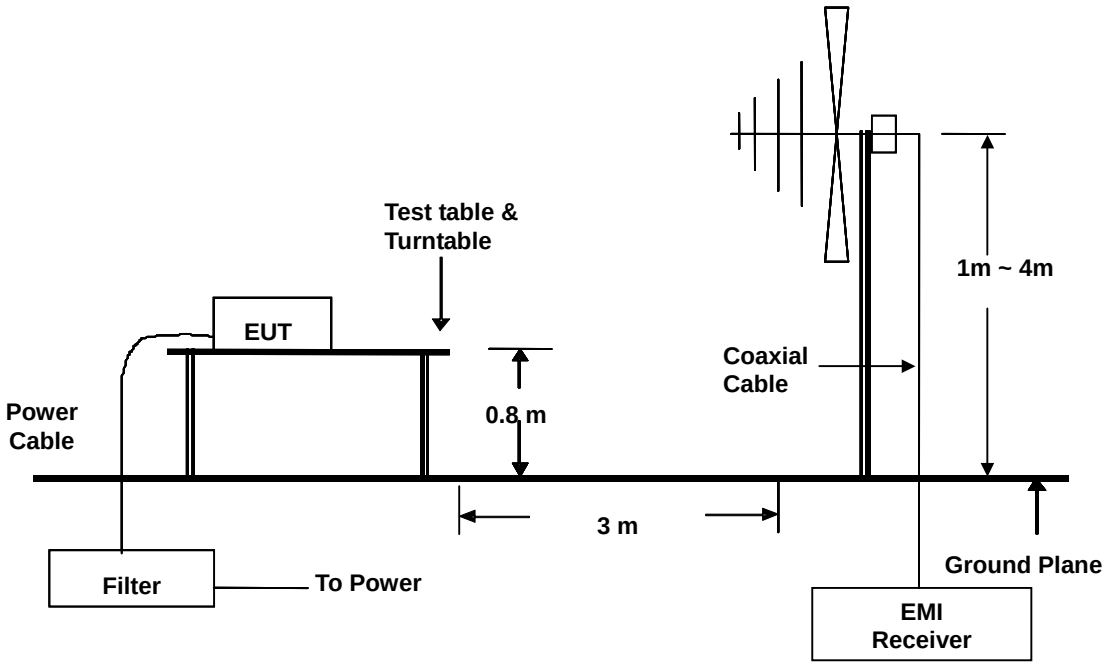
Procedure of Preliminary Test

- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per ANSI C63.4.
- All I/O cables were positioned to simulate typical usage as per ANSI C63.4.
- The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 3 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 2000MHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 2000MHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.
- The test data of the worst-case condition(s) was recorded.

7.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

7.5. DATA SAMPLE

Below 1GHz

Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q/A)	Pol. (H/V)
x.xx	14.0	12.2	26.2	40	-13.8	Q	H

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Antenna Factor + Cable Loss + Attenuator (3/6/10dB) – Amplifier Gain
Amptd = Uncorrected Analyzer/Receiver reading + Factor
Limit = Limit stated in standard
Margin = Reading in reference to limit
P = Peak Reading
Q = Quasi-peak Reading
A = Average Reading
H = Antenna Polarization: Horizontal
V = Antenna Polarization: Vertical

Calculation Formula

Margin (dB) = Result (dBuV/m) – Limit (dBuV/m)

Above 1GHz

Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/A)	Pol. (H/V)
x.xx	42.95	0.55	43.50	54	-10.50	A	H

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Factor = Antenna Factor + Cable Loss - Amplifier Gain
Result = Reading + Factor
Limit = Limit stated in standard
Margin = Result – Limit
P = Peak Reading
A = Average Reading
H = Antenna Polarization: Horizontal
V = Antenna Polarization: Vertical

7.6. TEST RESULTS

Below 1GHz

Model No.	TF-ONYX-A65-A1-1010	**Test Mode**	Mode 1
Environmental Conditions	26deg.C, 78% RH, 1010hPa	**6dB Bandwidth**	120 KHz
Antenna Pole	Vertical / Horizontal	**Antenna Distance**	3m
Detector Function	Quasi-peak.	**Tested by**	Jason Lee

(The chart below shows the highest readings taken from the final data.)

Six Highest Radiated Emission Readings							
Frequency Range Investigated				**30 MHz to 1000 MHz at 3m**			
Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q/A)	Pol. (H/V)
66.4560	**48.20**	**-23.33**	**24.87**	**40.00**	**-15.13**	**Q**	**V**
240.2700	**46.80**	**-16.43**	**30.37**	**46.00**	**-15.63**	**Q**	**V**
315.7800	**43.50**	**-13.77**	**29.73**	**46.00**	**-16.27**	**Q**	**V**
513.3900	**38.40**	**-8.71**	**29.69**	**46.00**	**-16.31**	**Q**	**V**
540.2800	**38.70**	**-7.95**	**30.75**	**46.00**	**-15.25**	**Q**	**V**
932.5700	**35.20**	**-1.46**	**33.74**	**46.00**	**-12.26**	**Q**	**V**

Six Highest Radiated Emission Readings							
Frequency Range Investigated				**30 MHz to 1000 MHz at 3m**			
Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector (P/Q/A)	Pol. (H/V)
372.8300	**44.20**	**-12.10**	**32.10**	**46.00**	**-13.90**	**Q**	**H**
540.2800	**39.70**	**-7.95**	**31.75**	**46.00**	**-14.25**	**Q**	**H**
649.7300	**39.20**	**-6.71**	**32.49**	**46.00**	**-13.51**	**Q**	**H**
840.2700	**36.70**	**-3.16**	**33.54**	**46.00**	**-12.46**	**Q**	**H**
864.1100	**35.90**	**-2.70**	**33.20**	**46.00**	**-12.80**	**Q**	**H**
936.7200	**33.40**	**-1.38**	**32.02**	**46.00**	**-13.98**	**Q**	**H**

REMARKS: *1. 30MHz to 1000MHz test is Applicable Part 15.109 standard.*
2. The other emission levels were very low against the limit.
3. P= Peak Reading; Q= Quasi-peak Reading.

Above 1GHz

Model No.	TF-ONYX-A65-A1-1010	**Test Mode**	Mode 1
Environmental Conditions	26deg.C, 60% RH, 1010hPa	**6dB Bandwidth**	120 KHz
Antenna Pole	Vertical / Horizontal	**Antenna Distance**	3m
Detector Function	Quasi-peak.	**Tested by**	Jason Lee

(The chart below shows the highest readings taken from the final data.)

Highest Radiated Emission Readings							
Frequency Range Investigated				**30 MHz to 2000 MHz at 3m**			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark (P/Q/A)	Pol. (H/V)
1102.000	**54.38**	**-10.99**	**43.39**	**74.00**	**-30.61**	**P**	**V**
1176.000	**53.51**	**-10.62**	**42.89**	**74.00**	**-31.11**	**P**	**V**
1288.000	**53.45**	**-10.06**	**43.39**	**74.00**	**-30.61**	**P**	**V**
1358.000	**54.05**	**-9.71**	**44.34**	**74.00**	**-29.66**	**P**	**V**
1426.000	**54.02**	**-9.37**	**44.65**	**74.00**	**-29.35**	**P**	**V**
1794.000	**52.59**	**-7.18**	**45.41**	**74.00**	**-28.59**	**P**	**V**

Highest Radiated Emission Readings							
Frequency Range Investigated				**30 MHz to 2000 MHz at 3m**			
Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark (P/Q/A)	Pol. (H/V)
1102.000	**56.69**	**-10.99**	**45.70**	**74.00**	**-28.30**	**P**	**H**
1176.000	**54.04**	**-10.62**	**43.42**	**74.00**	**-30.58**	**P**	**H**
1288.000	**53.70**	**-10.06**	**43.64**	**74.00**	**-30.36**	**P**	**H**
1358.000	**52.72**	**-9.71**	**43.01**	**74.00**	**-30.99**	**P**	**H**
1426.000	**53.18**	**-9.37**	**43.81**	**74.00**	**-30.19**	**P**	**H**
1794.000	**53.46**	**-7.18**	**46.28**	**74.00**	**-27.72**	**P**	**H**

NOTE: *1. The other emission levels were very low against the limit.*

2. P= Peak Reading; A= Average Reading.

8 PHOTOGRAPHS OF THE TEST CONFIGURATION

LINE CONDUCTED EMISSION TEST

RADIATED EMISSION TEST