

## ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

### INTENTIONAL RADIATOR CERTIFICATION TO FCC PART 15 SUBPART C REQUIREMENT

OF

**Product Name:** A Versatile Multi-Function Terminal

**Brand Name:** unitech

**Model Name:** MT380-A7WE0G

**Model Differences:** N/A

**FCC ID:** HLEMT38MIFARE01

**Report No.:** ER/2008/70048

**Issue Date:** Feb. 20, 2009

**FCC Rule Part:** §15.225

**Prepared for:** Unitech Electronics Co., Ltd.

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**VERIFICATION OF COMPLIANCE**

**Applicant:** Unitech Electronics Co., Ltd.  
8Fl., No. 118, Lane 235, Pao-Chiao Rd., Hsin-Tien City, Taipei Hsien,  
Taiwan 231, R.O.C.

**Product Name:** A Versatile Multi-Function Terminal

**FCC ID:** HLEMT38MIFARE01

**Brand Name:** unitech

**Model No.:** MT380-A7WE0G

**Model Difference:** N/A

**File Number:** ER/2008/70048

**Date of Test:** Jul. 30, 2008 ~ Feb. 18, 2009

**Date of EUT Received:** Jul. 30, 2008

**We hereby certify that:**

The above equipment was tested by SGS Taiwan Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2003) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.225

The test results of this report relate only to the tested sample identified in this report.

Test By:



Date:

Feb. 20, 2009

Jason Wu / Asst. Supervisor

Prepared By:



Date:

Feb. 20, 2009

Eva Kao / Asst. Supervisor

Approved By:



Date:

Feb. 20, 2009

Vincent Su / Manager

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## Version

Version No.	Date	Description
00	Feb. 20, 2009	Initial creation of document

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name	A Versatile Multi-Function Terminal	
Brand Name	unitech	
Model Name	MT380-A7WE0G	
Model Difference	N/A	
Power Supply	3.7 Vdc by Li-ion battery or 12dc by AC/DC power adapter Battery: P/N: 602579G Adapter: Model: SYS1308-2412-WZ	

#### WLAN:

Frequency Range:	2412 – 2462 MHz
Channel number:	11 channels
Max. Output Power:	802.11 b: 15.33 dBm (Peak) 802.11 g: 15.72dBm (Peak)
Modulation Technology:	DSSS, OFDM
Modulation type:	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transition Rate:	802.11 b: 1/2/5.5/11 Mbps; 802.11 g: 6/9/12/18/24/36/48/54 Mbps
Antenna Designation:	PIFA Antenna / 0.33dBi.
Type of Emission	16M5M5D

The EUT is compliance with IEEE 802.11 b/g Standard.

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## RFID:

Operating Frequency	13.56MHz
Transmit Power	< 123dBuV/m at 3m.
Number of Channels	1
Operating Mode	Point-to-Point
Antenna Type	A permanent fixed antenna, which is built-In, designed as an indispensable part of the EUT.
Module Type	ASK

The EUT is compliance with RFID Standard.

This report applies for RFID.

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## 1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **HLEMT38MIFARE01** filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules. The composite system (digital device) is compliance with Subpart B is authorized under a DoC procedure.

## 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 (2003)1992. Radiated testing was performed at an antenna to EUT distance 3 meters.

## 1.4 Test Facility

The measurement facilities used to collect the 3m Radiated Emission and AC power line conducted data are located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 134, Wu Kung Rd., Wuku Industrial Zone, Taipei Country, Taiwan which are constructed and calibrated to meet the FCC requirements in documents ANSI C63.4: 2003. FCC Registration Number are: 990257 and 236194, Canada Registration Number: 4620A-1.

The 10 m Open Area Test Sites located on the address of SGS Taiwan Ltd. Electronics & Communication Laboratory No. 29, Pau-Tou-Tsuo Valley Chia-Pau Tsuen, Linkou Hsiang, Taipei county, which is constructed and calibrated to meet the CISPR 22/EN 55022 requirements. SGS Site No. 1(3 &10 meters) and FCC Registration Number: 94644.

## 1.5 Special Accessories

Not available for this EUT intended for grant.

## 1.6 Equipment Modifications

Not available for this EUT intended for grant.

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## 2 System Test Configuration

### 2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

### 2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

### 2.3 Test Procedure

#### 2.3.1 Conducted Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 7 and 13 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak and average detector mode.

#### 2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4-2003.

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## 2.4 Limitation

### (1) Conducted Emission

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency range MHz	Limits dB (uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

**Note**

1. The lower limit shall apply at the transition frequencies

2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

### (2) Radiated Emission

- a. The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- b. Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- c. Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- d. The field strength of any emissions appearing outside of the 13.110-14.010 MHz shall not exceed the general radiated emission limits in section 15.209(Intentional Radiators general limit).as below.

Frequency (MHz)	Field strength μV/m	Distance (m)	Field strength at 3m dBμV/m
1.705-30	30	30	69.54
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

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Remark:

1. Emission level in dBuV/m=20 log (uV/m)
2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of  $\xi$  15.205
4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of  $\xi$  15.205, then the general radiated emission limits in  $\xi$  15.209 apply.

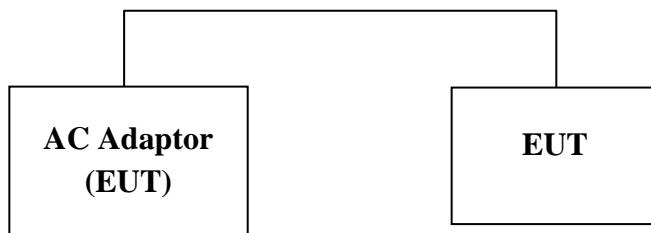
### (3) Frequency Tolerance

The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

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## 2.5 Configuration of Tested System

**Fig. 2-1 Configuration of Tested System**



**Table 2-1 Equipment Used in Tested System**

Equipment	Mfr/Brand	Model/ Type No.	FCC ID	Series No.
N/A				

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### 3 Summary of Test Results

FCC Rules	Description Of Test	Result
§15.207	Conducted Emission	Compliant
§15.225 (a), (d)	Radiated Emission	Compliant
§15.225 (e)	Frequency Stability	Compliant

### 4 Description of test modes

The EUT stay in continuous transmitting mode. The frequency 13.56 MHz is chosen for radiated emission testing.

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## 5 Conducted Emissions Test

### 5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

### 5.2 Test SET-UP (Block Diagram of Configuration)

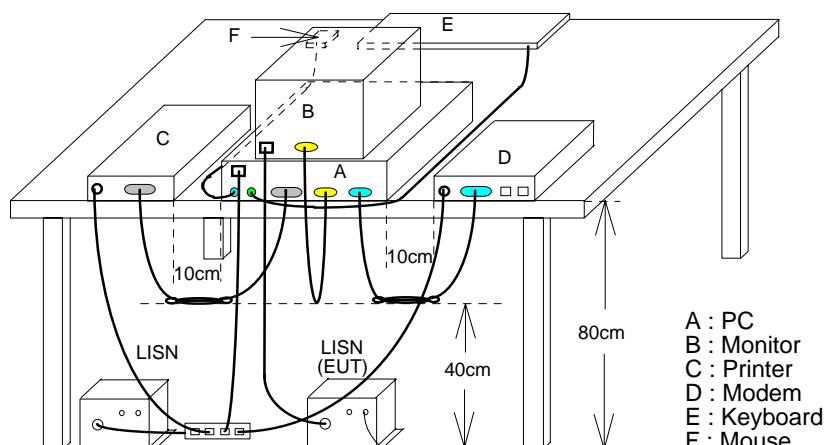


Fig. 2

### 5.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	R&S	ESCS30	828985/004	09/16/2008	09/15/2009
LISN	Rolf-Heine	NNB-2/16Z	99012	04/28/2008	04/27/2009
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	04/28/2008	04/27/2009
Coaxial Cables	N/A	WK CE Cable	N/A	10/30/2008	10/29/2009

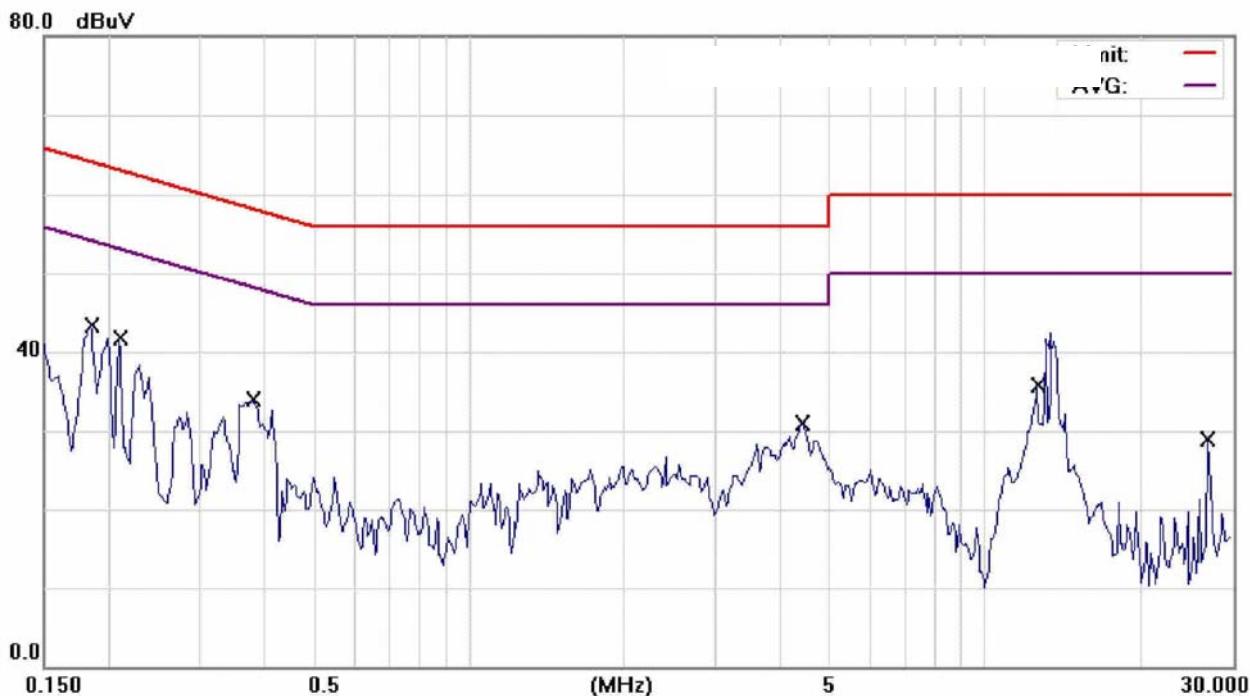
### 5.4 Measurement Result:

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peak.

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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	RFID Operation Mode		Test Date:	Feb. 04, 2009
Temperature:	26 °C	Humidity:	62 %	Test By: Jason



Site SGS CONDUCTED #1

Phase: **L1**

Temperature: 26 °C

Limit: CISPR22/11 Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 62 %

EUT: A Versatile Multi-Function Terminal

Distance:

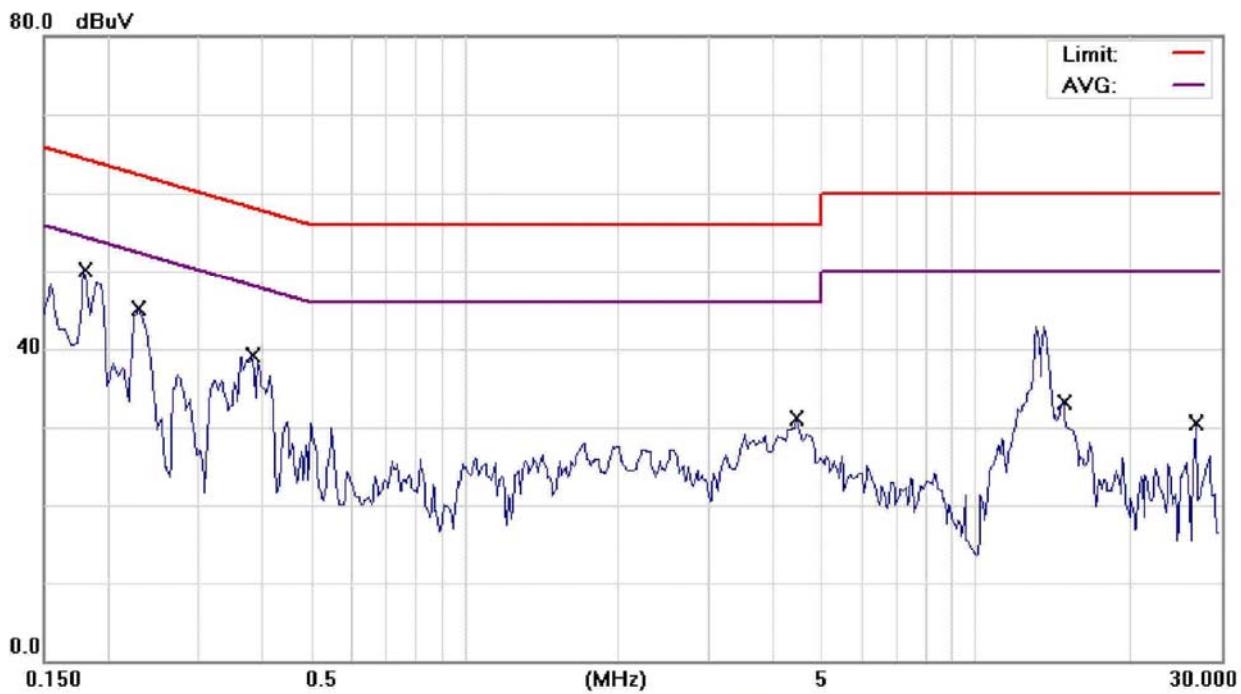
Air Pressure: hpa

M/N: MT380-A7WE0G

Note: RFID Operation

No.	Mk.	Freq.	Reading Level	Factor	Measure- ment	Limit	Over	
							dB	Detector
1	*	0.1850	43.12	0.24	43.36	64.26	-20.90	QP
2		0.2100	41.56	0.16	41.72	63.21	-21.49	QP
3		0.3800	33.73	0.10	33.83	58.28	-24.45	QP
4		4.4200	30.81	0.05	30.86	56.00	-25.14	QP
5		12.6600	35.53	0.12	35.65	60.00	-24.35	QP
6		27.1200	28.71	0.25	28.96	60.00	-31.04	QP

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Site SGS CONDUCTED #1 Phase: **N** Temperature: 26 °C  
 Limit: CISPR22/11 Class B Conduction(QP) Power: AC 120V/60Hz Humidity: 62 %  
 EUT: A Versatile Multi-Function Terminal Distance: Air Pressure: hpa  
 M/N: MT380-A7WE0G  
 Note: RFID Operation

No.	Mk.	Freq.	Reading	Factor	Measure- ment	Limit	Over		
			Level				dB	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV			
1	*	0.1800	49.84	0.24	50.08	64.49	-14.41	QP	
2		0.2300	44.96	0.13	45.09	62.45	-17.36	QP	
3		0.3850	38.93	0.08	39.01	58.17	-19.16	QP	
4		4.4700	31.12	0.05	31.17	56.00	-24.83	QP	
5		14.9000	32.78	0.24	33.02	60.00	-26.98	QP	
6		27.1200	30.28	0.25	30.53	60.00	-29.47	QP	

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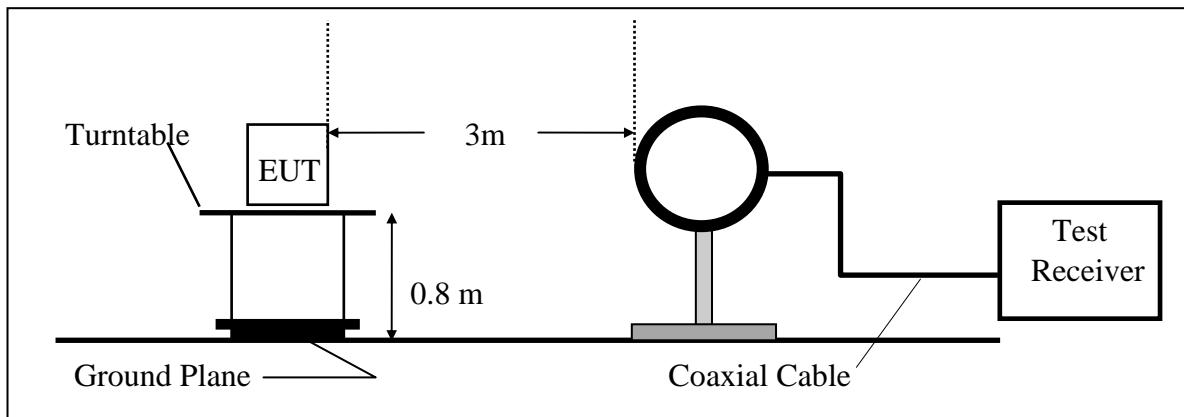
## 6 Radiated Emission Test

### 6.1 Measurement Procedure

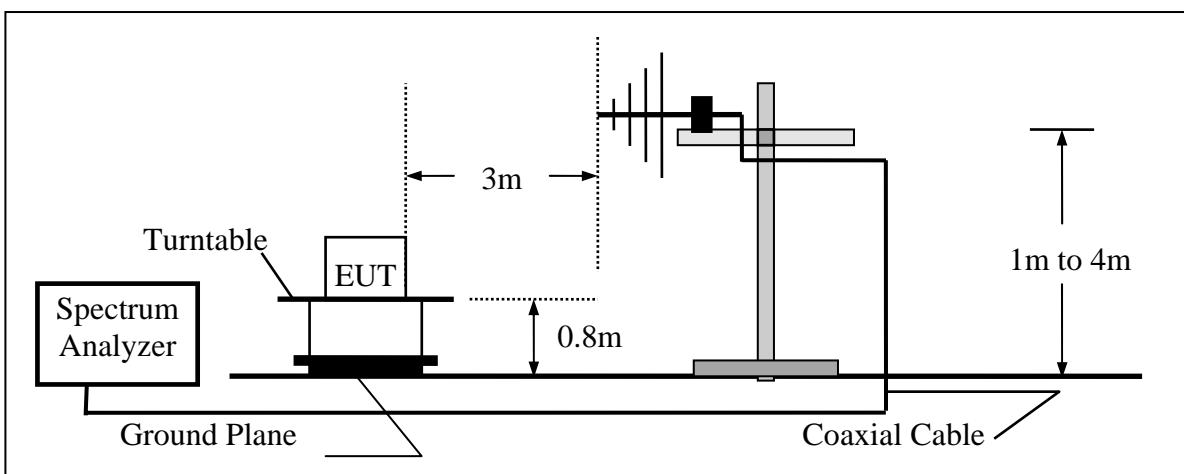
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured were complete.

### 6.2 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



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### 6.3 Measurement Equipment Used:

966 Chamber					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	R&S	FSP 40	100034	02/22/2008	02/21/2009
Bilog Antenna	SCHWAZBECK	VULB9160	9160-3136	11/15/2008	11/14/2009
Loop antenna	MESSTEC	FLA30	03/10086	06/06/2007	06/05/2009
Pre-Amplifier	Agilent	8447D	1937A02834	11/30/2008	11/29/2009
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2009	01/04/2010
Turn Table	HD	DT420	N/A	N.C.R	N.C.R
Antenna Tower	HD	MA240-N	240/657	N.C.R	N.C.R
Controller	HD	HD100	N/A	N.C.R	N.C.R
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-10M	10m	01/05/2009	01/04/2010
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2009	01/04/2010

### 6.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CL - AG$$

Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

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## 6.5 Measurement Result

Operation Mode: Transmitting Mode  
 Fundamental Frequency: 13.56 MHz  
 Temperature : 25 °C  
 Humidity : 65 %

Test Date : Feb. 18, 2009  
 Test By: Jason  
 Pol: Vertical

Detector						Safe Margin	Note
Freq. (MHz)	Ant.Pol. H/V	Mode (PK/AV/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit@3m (dBuV/m)	
13.56	V	Peak	55.34	-5.48	49.86	123.99	-74.13 F
27.12	V	Peak	23.19	-0.17	23.02	69.54	-46.52 H
40.68	V	Peak	--				
54.24	V	Peak	--				
67.80	V	Peak	--				
81.36	V	Peak	--				
94.92	V	Peak	--				
108.48	V	Peak	--				
122.04	V	Peak	--				
135.60	V	Peak	--				
410.24	V	Peak	48.14	-9.64	38.50	46.00	-7.50 E
449.04	V	Peak	47.01	-8.61	38.40	46.00	-7.60 E
652.74	V	Peak	45.16	-4.96	40.20	46.00	-5.80 E
902.03	V	Peak	40.97	-1.07	39.90	46.00	-6.10 E

### Remark :

- (1) Measuring frequencies from 25 MHz to the 1GHz .
- (2) Radiated emissions measured in frequency range from 25 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (4) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

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Operation Mode: Transmitting Mode  
 Fundamental Frequency: 13.56 MHz  
 Temperature : 25 °C  
 Humidity : 65 %

Test Date : Feb. 18, 2009  
 Test By: Jason  
 Pol: Horizontal

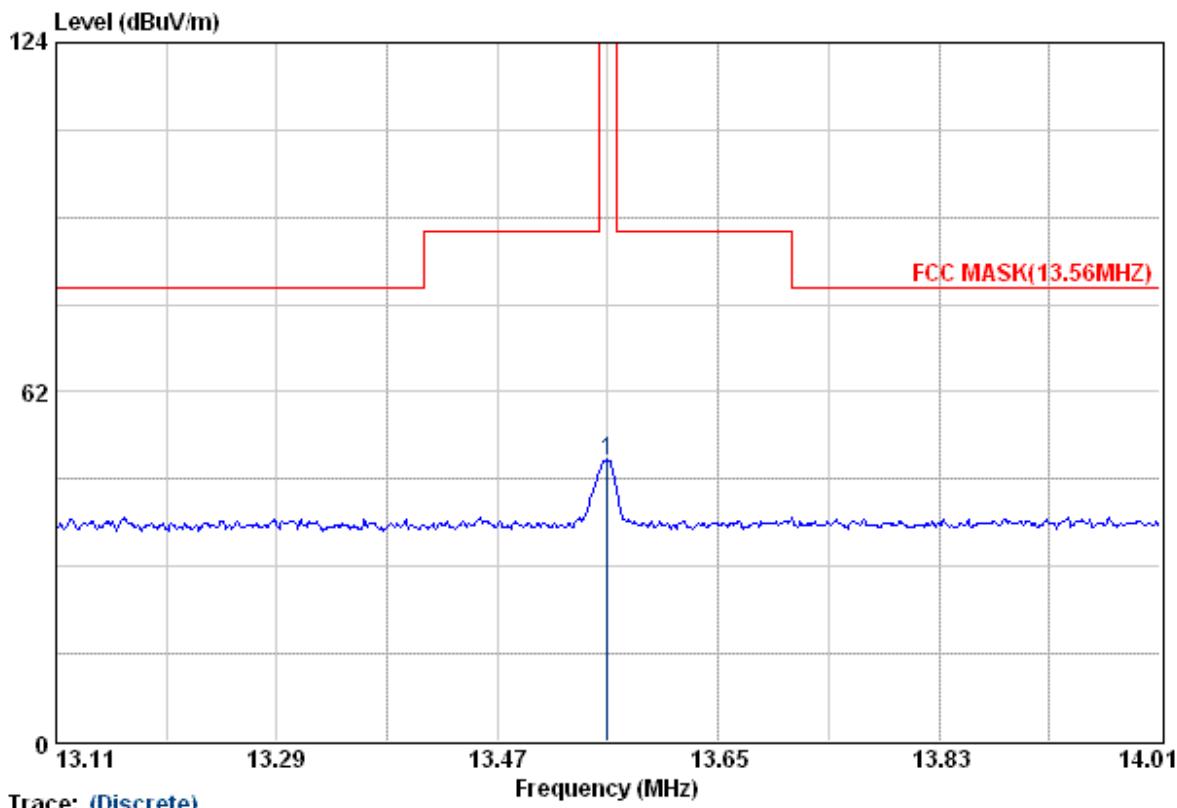
Freq. (MHz)	Ant.Pol. H/V	Detector			Factor (dB)	Actual FS (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)	Safe Note
		Mode (PK/AV/QP)	Reading (dBuV)						
13.56	V	Peak	55.34	-5.48	49.86	123.99	-74.13	F	
27.12	V	Peak	--						
40.68	V	Peak	--						
54.24	V	Peak	--						
67.80	V	Peak	--						
81.36	V	Peak	--						
94.92	V	Peak	--						
108.48	V	Peak	--						
122.04	V	Peak	--						
135.60	V	Peak	--						
208.48	V	Peak	41.75	-15.32	26.43	43.50	-17.07	E	
313.24	V	Peak	44.23	-12.70	31.53	46.00	-14.47	E	
449.04	V	Peak	42.32	-8.61	33.71	46.00	-12.29	E	
589.69	V	Peak	42.13	-6.36	35.77	46.00	-10.23	E	
657.59	V	Peak	42.58	-4.98	37.60	46.00	-8.40	E	

## Remark :

- (1) Measuring frequencies from 25 MHz to the 1GHz .
- (2) Radiated emissions measured in frequency range from 25 MHz to 1000MHz were made with an instrument using Peak detector mode.
- (3) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (4) Data of measurement within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of SPA between 25MHz to 30MHz was 10KHz; 30MHz to 1GHz was 100KHz.

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## Radiated Mask



Site : RF SITE  
 Condition : FCC MASK(13.56MHZ) 3m FLA30 VERTICAL 149cm 360deg  
 Project No. : ER/2008/80029  
 Applicant : unitech  
 EUT Description : A Versatile Multi-Function Terminal  
 EUT Model : MT380-A7WE0G  
 Test Mode : E1 Plan/TX Mode  
 Temp./Humid. : 25/65  
 Operator : Jason

	Read	Antenna	Preamp	Cable	Limit	Over	Over	Remar	
	Freq	Level	Factor	Factor	Loss	Factor	Line	Limit	
	MHz	dBuV	dB/m	dB	dB	dB/m	dBuV/m	dBuV/m	dB
1	13.56	55.34	22.82	28.65	0.35	-5.48	49.86	124.00	-74.14 Peak

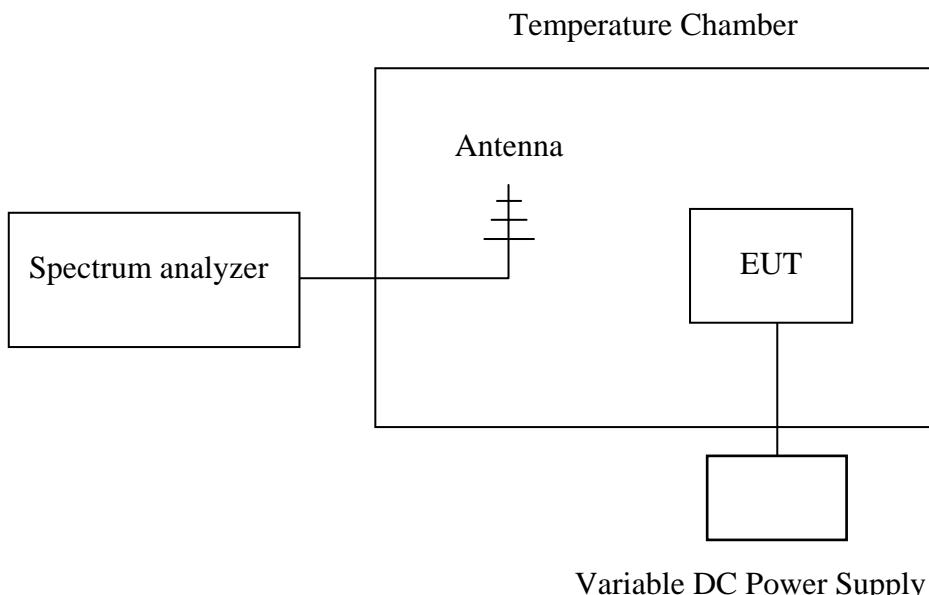
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## 7 Frequency Tolerance

### 7.1 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW, VBW= 10kHz, Span =100kHz.
4. Set SPA Max hold. Mark peak, -26dB.

### 7.2 Test SET-UP (Block Diagram of Configuration)



### 7.3 Measurement Equipment Used:

Same as 6.2 Radiated Emission Measurement.

### 7.4 Measurement Results

Refer to attached data chart.

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## A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (°C)	(MHz)		
12	-20	13.561522	-21.00	+/- 1.356
12	-10	13.561521	-20.00	+/- 1.356
12	0	13.561501	0.00	+/- 1.356
12	10	13.561503	-2.00	+/- 1.356
12	20	13.561501	0.00	+/- 1.356
12	30	13.561499	2.00	+/- 1.356
12	40	13.561497	4.00	+/- 1.356
12	50	13.561496	5.00	+/- 1.356

## B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
Vdc	Temperature (°C)	(MHz)		
13.8	20	13.561512	-11.00	+/- 1.356
12	20	13.561501	0.00	+/- 1.356
10.2	20	13.561487	14.00	+/- 1.356

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