

# ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT

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

OF

**Product Name:** Multilane POS Terminal

**Brand Name:** Hypercom

**Model Name:** L53X0, L54X0

**Model Differences:** for Market Segmentation

**FCC ID:** NVA00005

**Report No.:** ER/2010/80004

**Issue Date:** Aug. 25, 2010

**FCC Rule Part:** §15.225

**Prepared for:** Hypercom Corporation  
8888 E. Raintree Drive, Suite 300 Scottsdale, AZ  
85260 USA

**Prepared by:** SGS Taiwan Ltd.  
Electronics & Communication Laboratory  
No. 134, Wu Kung Rd., Wuku Industrial Zone,  
Taipei County, Taiwan



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## VERIFICATION OF COMPLIANCE

**Applicant:** Hypercom Corporation  
8888 E. Raintree Drive, Suite 300 Scottsdale, AZ 85260 USA

**Product Name:** Multilane POS Terminal

**FCC ID:** NVA00005

**Brand Name:** Hypercom

**Model No.:** L53X0, L54X0

**Model Difference:** for Market Segmentation

**File Number:** ER/2010/80004

**Date of Test:** Aug. 16, 2010 ~ Aug. 24, 2010

**Date of EUT Received:** Aug. 16, 2010

## 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:

Jazz Huang

Date:

Aug. 25, 2010

Jazz Huang / Engineer

Prepared By:

Eva Kao

Date:

Aug. 25, 2010

Eva Kao / Asst. Supervisor

Approved By

Arno Hsieh

Date:

Aug. 25, 2010

Arno Hsieh / Asst. Supervisor

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## Version

Version No.	Date	Description
00	Aug. 25, 2010	Initial creation of document

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## 1 GENERAL INFORMATION

### 1.1 Product Description

Product Name	Multilane POS Terminal
Brand Name	Hypercom
Model Name	L53X0, L54X0
Model Difference	for Market Segmentation
Power Supply	12dc by AC/DC power adapter, model: NU40-8120250-I3

#### RFID:

Operating Frequency	13.56MHz
Transmit Power	< 123dBuV/m at 3m.
Number of Channels	1
Operating Mode	Point-to-Point
Antenna Type	Loop Antenna
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: **NVA00005** filing to comply with Section 15.225 of the FCC Part 15, Subpart C Rules.

## 1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. 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-04.

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

- The field strength of any emission within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
- 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.
- 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.
- 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 $\mu\text{V/m}$	Distance (m)	Field strength at 3m $\text{dB}\mu\text{V/m}$
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 § 15.205
  4. Emission spurious frequency which appearing within the Restricted Bands specified in provision of §15.205, then the general radiated emission limits in § 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.

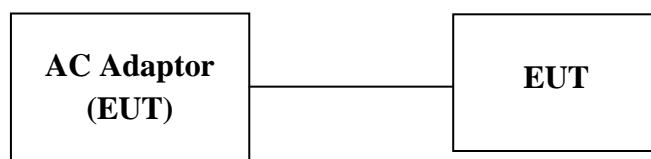
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## 2.5 Configuration of Tested System

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



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

Item	Equipment	Mfr/Brand	Model/ Type No.	Series No.	Data Cable	Power Cord
1.	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 was tested when placed horizontally on the EUT table as on a counter, and also when placed vertically on the table as when mounted on a wall. This report shows the results from testing in the worst-case emission configuration

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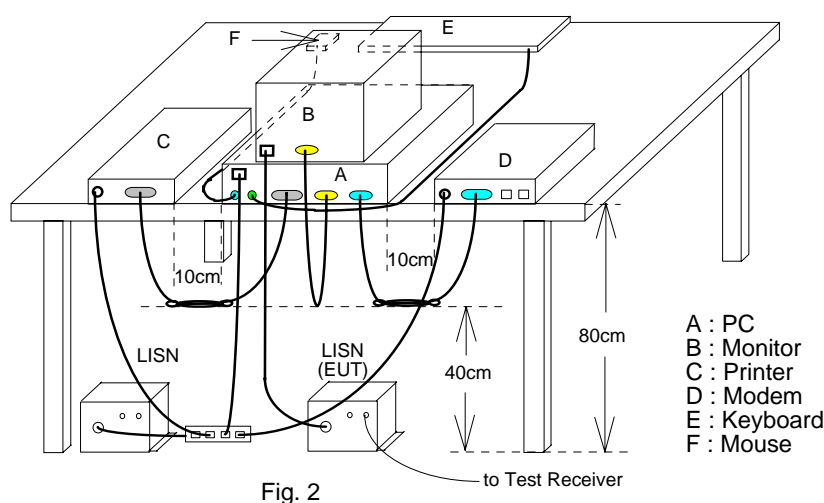
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## 5 Conducted Emissions Test

### 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)



### 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	09/16/2009	09/15/2010
LISN	Rolf-Heine	NNB-2/16Z	99012	02/02/2010	02/01/2011
LISN	FCC	FCC-LISN-50/250-25-2-01	04034	02/02/2010	02/01/2011
Coaxial Cables	N/A	WK CE Cable	N/A	10/30/2009	10/29/2010

### 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.

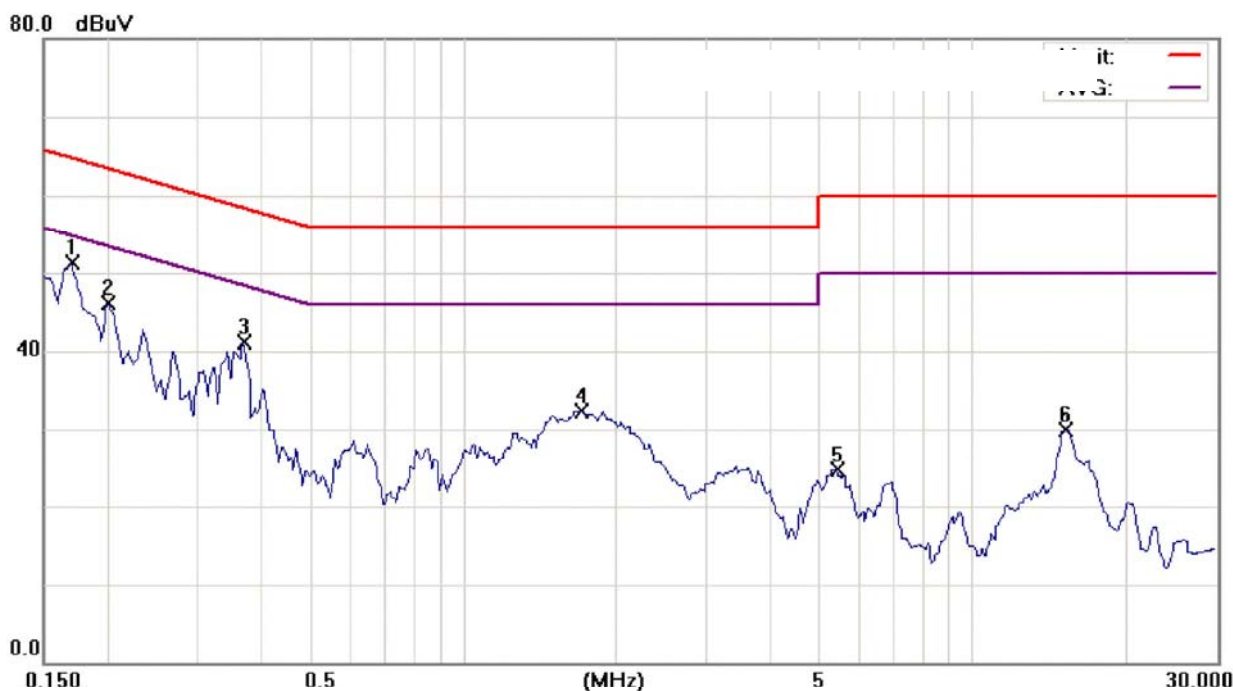
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## AC POWER LINE CONDUCTED EMISSION TEST DATA

Operation Mode:	RFID Mode	Test Date:	Aug. 20, 2010
		Test By:	Jazz



Site SGS CONDUCTED #1  
 Limit: FCC Class B Conduction(QP)  
 EUT: Multilane POS Terminal  
 M/N: L53X0  
 Note: RFID MODE LINK

Phase: N  
 Power: AC 120V/60Hz  
 Distance:

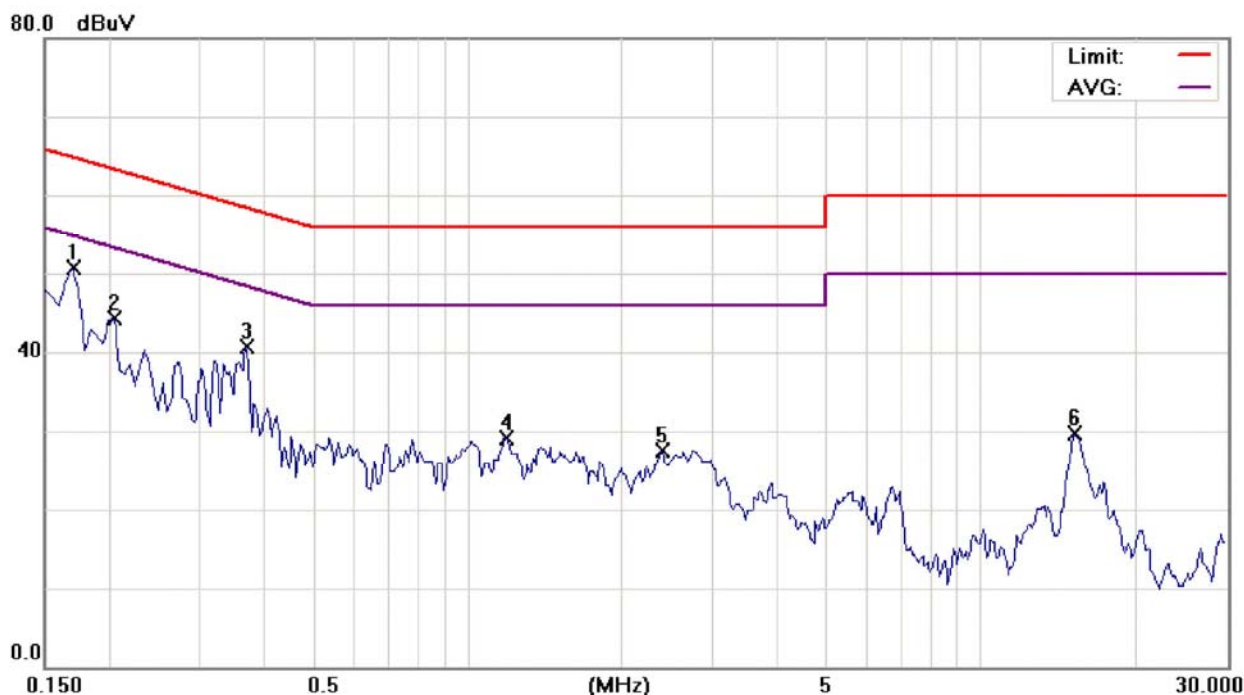
Temperature: 23 °C  
 Humidity: 56 %  
 Air Pressure: hpa

No.	Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1700	51.10	0.13	51.23	64.96	-13.73	peak	
2		0.2000	46.02	0.12	46.14	63.61	-17.47	peak	
3		0.3700	40.97	0.12	41.09	58.50	-17.41	peak	
4		1.7000	32.21	0.15	32.36	56.00	-23.64	peak	
5		5.4200	24.56	0.24	24.80	60.00	-35.20	peak	
6		15.2400	29.42	0.56	29.98	60.00	-30.02	peak	

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Site SGS CONDUCTED #1

Phase: **L1**

Temperature: 23 °C

Limit: FCC Class B Conduction(QP)

Power: AC 120V/60Hz

Humidity: 56 %

EUT: Multilane POS Terminal

Distance:

Air Pressure: hpa

M/N: L53X0

Note: RFID MODE LINK

No.	Mk.	Freq. MHz	Reading Level dBuV	Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1700	50.57	0.13	50.70	64.96	-14.26	peak	
2		0.2050	44.25	0.12	44.37	63.41	-19.04	peak	
3		0.3700	40.64	0.12	40.76	58.50	-17.74	peak	
4		1.1900	28.98	0.13	29.11	56.00	-26.89	peak	
5		2.3900	27.40	0.17	27.57	56.00	-28.43	peak	
6		15.2200	29.06	0.56	29.62	60.00	-30.38	peak	

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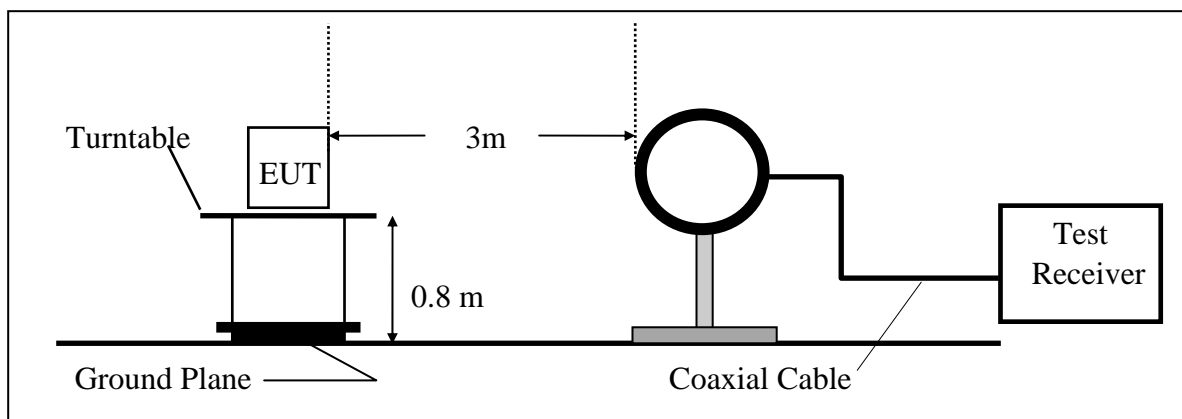
## 6 Radiated Emission Test

### 6.1 Measurement Procedure

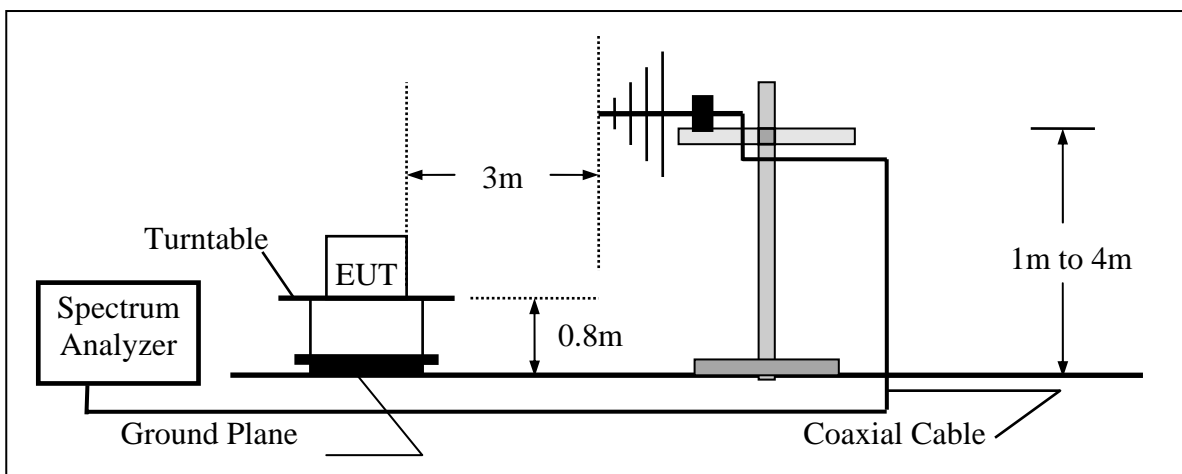
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above 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	02/12/2010	02/11/2011
Loop antenna	MESSTEC	FLA30	03/10086	07/08/2009	07/07/2011
Bilog Antenna	SCHWAZBECK	VULB9160	3136	11/19/2009	11/18/2010
Pre-Amplifier	Agilent	8447D	1937A02834	11/28/2009	11/28/2010
Pre-Amplifier	Agilent	8449B	3008A01973	01/05/2010	01/04/2011
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	01/05/2010	01/04/2011
Low Loss Cable	HUBER+SUHNER	SUCOFLEX 104PEA-3M	3m	01/05/2010	01/04/2011
3m Site	SGS	966 chamber	N/A	11/08/2009	11/09/2010

### 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 : Aug. 23, 2009  
Test By: Jazz  
Pol: Vertical

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/AV/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit@3m (dBuV/m)	Safe Margin (dB)	Note
13.56	V	Peak	77.03	-5.30	71.73	123.99	-52.26	F
27.12	V	Peak	49.57	-0.32	49.25	69.54	-20.29	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	--					
250.19	V	Peak	52.35	-13.74	38.61	46.00	-7.39	E
332.64	V	Peak	50.23	-12.16	38.07	46.00	-7.93	E
480.08	V	Peak	47.90	-8.56	39.34	46.00	-6.66	E
649.83	V	Peak	42.76	-4.95	37.81	46.00	-8.19	E
688.63	V	Peak	40.95	-5.02	35.93	46.00	-10.07	E
892.33	V	Peak	36.95	-1.18	35.77	46.00	-10.23	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 : Aug. 23, 2009  
Test By: Jazz  
Pol: Horizontal

Freq. (MHz)	Ant.Pol. H/V	Detector Mode (PK/AV/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit@3m (dBuV/m)	Safe Margin (dB)	Note
13.56	H	Peak	78.07	-5.30	72.77	123.99	-51.22	F
27.12	H	Peak	--					
40.68	H	Peak	--					
54.24	H	Peak	--					
67.80	H	Peak	--					
81.36	H	Peak	--					
94.92	H	Peak	--					
108.48	H	Peak	55.14	-16.25	38.89	69.54	-30.65	H
122.04	H	Peak	--					
135.60	H	Peak	--					
252.13	H	Peak	50.27	-13.72	36.55	46.00	-9.45	E
400.54	H	Peak	48.56	-9.99	38.57	46.00	-7.43	E
480.08	H	Peak	42.21	-8.56	33.65	46.00	-12.35	E
649.83	H	Peak	42.76	-4.95	37.81	46.00	-8.19	E
841.89	H	Peak	40.47	-2.13	38.34	46.00	-7.66	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.

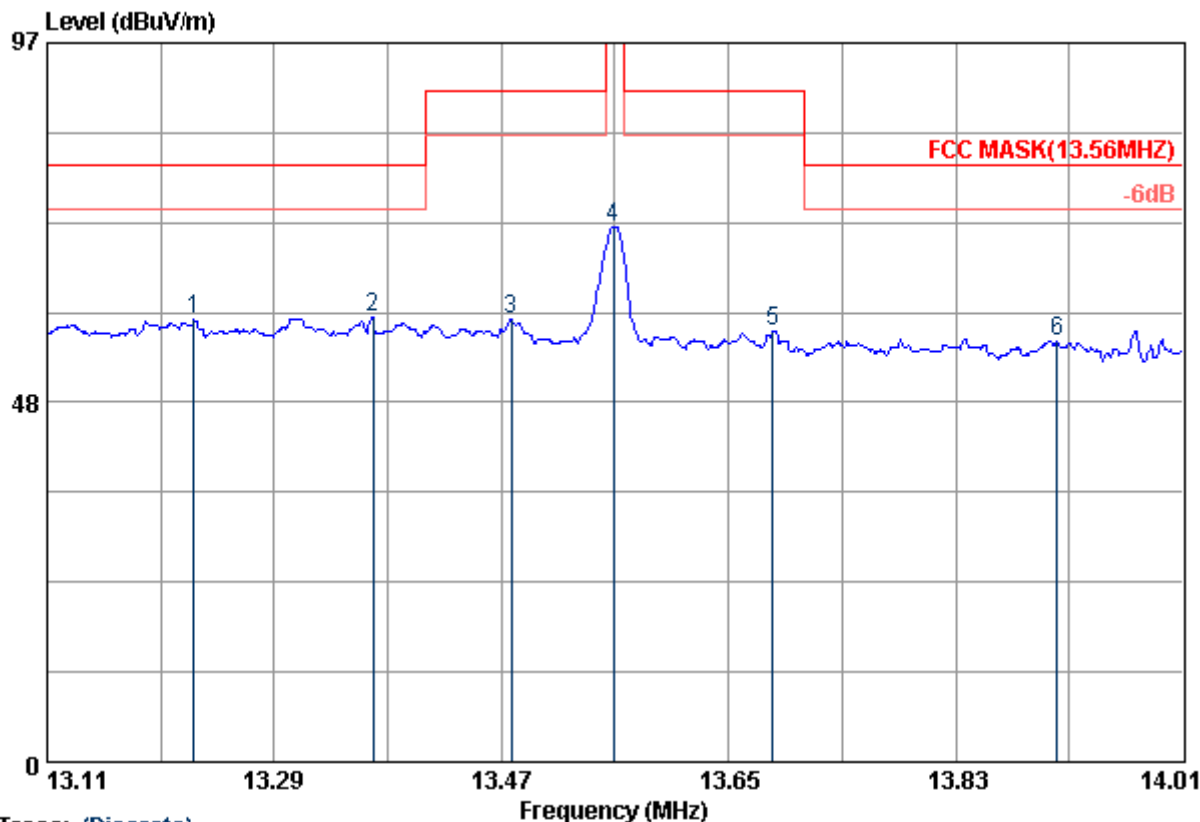
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## Radiated Mask

## Vertical:



Trace: (Discrete)

Site : RF SITE  
 Condition : FCC MASK(13.56MHZ) 3m FLA30 VERTICAL  
 Project No. : ER/2010/80004  
 Applicant : Hypercom Corporation  
 EUT Description : Multilane POS Terminal  
 EUT Model : L53XD  
 Test Mode : Mask H Plan  
 Temp./Humid. : 25/65  
 Operator : Jazz

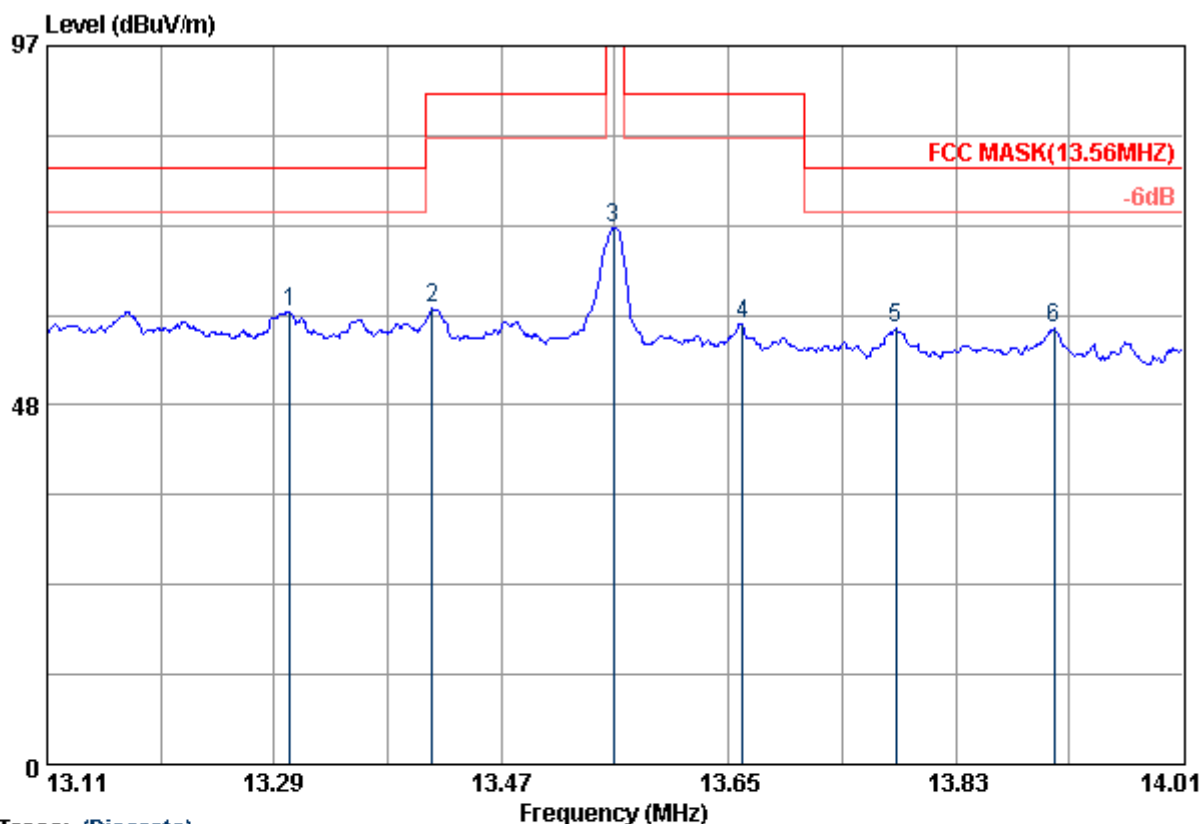
	Freq	Read Level	Cable Loss	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	13.23	65.08	0.38	-5.48	59.60	80.50	-20.90	Peak
2	13.37	65.42	0.38	-5.41	60.01	80.50	-20.49	Peak
3	13.48	65.00	0.38	-5.35	59.65	90.47	-30.82	Peak
4	13.56	77.50	0.38	-5.30	72.20	124.00	-51.80	Peak
5	13.69	63.30	0.39	-5.23	58.07	90.47	-32.40	Peak
6	13.91	61.92	0.39	-5.09	56.83	80.50	-23.67	Peak

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## Horizontal:



## Trace: (Discrete)

Site : RF SITE  
 Condition : FCC MASK(13.56MHz) 3m FLA30 HORIZONTAL  
 Project No. : ER/2010/80004  
 Applicant : Hypercom Corporation  
 EUT Description : Multilane POS Terminal  
 EUT Model : L53XD  
 Test Mode : Mask H Plan  
 Temp./Humid. : 25/65  
 Operator : Jazz

	Freq	Read Level	Cable Loss	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	13.30	66.51	0.38	-5.44	61.07	80.50	-19.43	Peak
2	13.42	66.91	0.38	-5.38	61.53	90.47	-28.94	Peak
3	13.56	77.69	0.38	-5.30	72.39	124.00	-51.61	Peak
4	13.66	64.68	0.39	-5.24	59.44	90.47	-31.03	Peak
5	13.78	63.96	0.39	-5.16	58.80	80.50	-21.70	Peak
6	13.91	63.95	0.39	-5.09	58.86	80.50	-21.64	Peak

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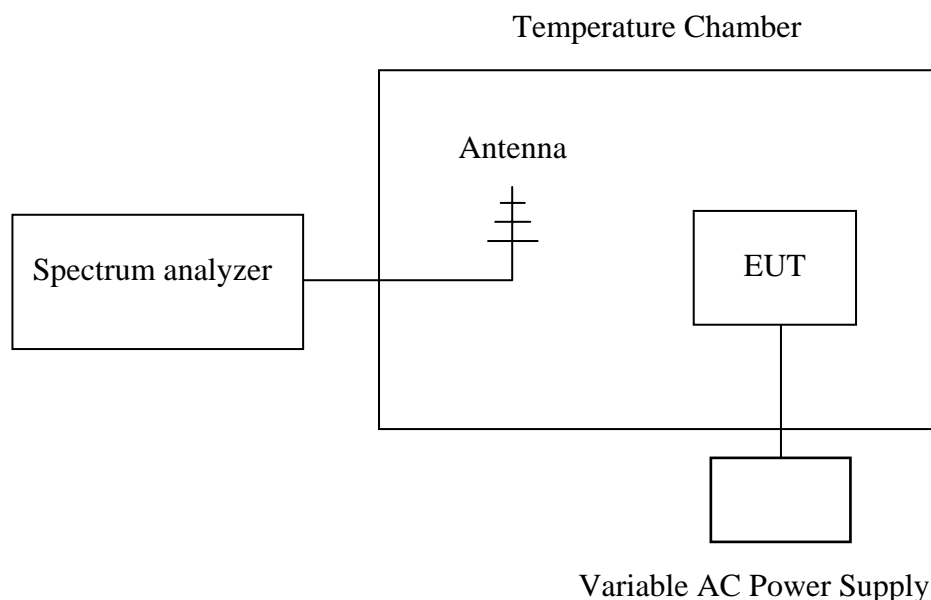
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## 7 Frequency Tolerance

### 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.

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



### 7.3 Measurement Equipment Used:

Conducted Emission Test Site					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4446A	MY43360126	04/19/2010	04/18/2012
Temperature Chamber	TERCHY	MHG-120LF	911009	04/30/2010	04/29/2012
AC Power Supply	APW-105N	887592	All Power	N/A	N/A

### 7.4 Measurement Results

Refer to attached data chart.

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### A. Temperature Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
V AC	Temperature (°C)	(MHz)		
120	-20	13.560941	-41.00	+/- 1.356
120	-10	13.560939	-39.00	+/- 1.356
120	0	13.560933	-33.00	+/- 1.356
120	10	13.560923	-23.00	+/- 1.356
120	20	13.5609	0.00	+/- 1.356
120	30	13.56088	20.00	+/- 1.356
120	40	13.560891	9.00	+/- 1.356
120	50	13.560888	12.00	+/- 1.356

### B. Supply Voltage Variation

Power Supply	Environment	Frequency	Delta (Hz)	Limit (KHz)
V AC	Temperature (°C)	(MHz)		
138	20	13.560891	9.00	+/- 1.356
120	20	13.560900	0.00	+/- 1.356
102	20	13.560881	19.00	+/- 1.356

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