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## FCC PART 15 SUBPART C RADIATED EMISSION TEST REPORT

### FCC Part 15.249

Report Reference No.....: VITE1010018R

Compiled by

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Name of the organization performing the tests

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Approved by

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Date of issue.....: Nov 22, 2010

Testing Laboratory Name .....: Shenzhen VITE Technology Co., Ltd

Address.....: Suite 2123, Building 4, Hongfa Centre, Central Area Baoan, Baoan District, Shenzhen, Guangdong, 518101, P.R. China

Applicant's name.....: ESP SYSTEMS, LLC.

Address.....: 401 N.Tryon St-10th Floor, Charlotte, North Carolina 28202 United States

#### Test specification:

Standard .....: FCC Part 15.249: Operation within the bands 920-928 MHz, 2400-2483.5 MHz, 5725-5850 MHz and 24.0 - 24.25 GHz.

TRF Originator.....: Shenzhen VITE Technology CO., Ltd

Master TRF.....: Dated 2009-03

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Test item description .....: HUB

Trade Mark .....: /

Model/Type reference.....: ESP-GEN2-02

Listed Models .....: /

Serial Number .....: /

Modulation .....: FHSS

Work Frequency.....: 2405 MHz~2480 MHz

Number of Channels.....: 16

Rate.....: AC 120V/60Hz from Adapter

Antenna Type.....: PCB antenna

Result.....: Positive

**T E S T   R E P O R T**

<b>Test Report No. :</b> <b>VITE1010018R</b>	Nov 22, 2010 Date of issue
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**Equipment under Test**                :        **HUB**

**Model /Type**                                :        ESP-GEN2-02

**Listed Models**                                :        /

**Applicant**                                        :        ESP SYSTEMS, LLC.

**Address**                                        :        401 N.Tryon St-10th Floor, Charlotte, North Carolina  
28202 United States

<b>Test Result</b> according to the standards on page 4:	<b>Positive</b>
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The test report merely corresponds to the test sample.  
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

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## 1. TEST STANDARDS

The tests were performed according to following standards:

[FCC Rules Part 15.249:](#) Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

[ANSI C63.4-2003](#)

[FCC Public Notice DA 00-705:](#) Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

## 2. SUMMARY

### 2.1. General Remarks

Date of receipt of test sample : Oct 25, 2010

Testing commenced on : Oct 26, 2010

Testing concluded on : Nov 20, 2010

### 2.2. Equipment Under Test

#### Power supply system utilised

Power supply voltage :   ● 120V / 60 Hz                      ○ 115V / 60Hz  
                                  ○ 12 V DC                               ○ 24 V DC  
                                  ○ Other (specified in blank below)

### 2.3. Short description of the Equipment under Test (EUT)

Wireless Transmitter work at 2405-2480MHz HUB.

For more details, refer to the user's manual of the EUT.

Serial number: Prototype

### 2.4. EUT operation mode

The EUT has been tested under typical operating condition.

### 2.5. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

● - supplied by the lab

● LCD Display	Manufacturer : lenovo Model No.: LXM-L17AB
● Mouse	Manufacturer : DELL Model No. : MOC5UO
● Keyboard	Manufacturer : DELL Model No. : L100
● PC	Manufacturer : ACER Model No. : Aspire R3600

## ● #1 AC Adapter

MODEL:FY 1605000  
INPUT:100-240V~50/60Hz 1.5A MAX  
OUTPUT:16.0V DC 5A  
Power Cable:180cm  
◇ Shield      ◆ Unshield

## ● #2 AC Adapter

MODEL:GFP241DA-0540-1  
INPUT:100-240V~50/60Hz 0.55A MAX  
OUTPUT:5.0V DC 4A  
Power Cable:180cm  
◇ Shield      ◆ Unshield

## 2.6. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: **UGDESP-GEN2-02** filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

## 2.7. Modifications

No modifications were implemented to meet testing criteria.

### 3. TEST ENVIRONMENT

#### 3.1. Address of the test laboratory

Bontek Compliance Testing Laboratory Ltd  
1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 (2003) and CISPR Publication 22.

#### 3.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

##### IC Registration No.: 7631A

The 3m alternate test site of Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on March, 2008.

##### FCC-Registration No.: 338263

Bontek Compliance Testing Laboratory Ltd EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 338263, March 24, 2008.

#### 3.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	<u>15-35 ° C</u>
Humidity:	<u>30-60 %</u>
Atmospheric pressure:	<u>950-1050mbar</u>

#### 3.4. Configuration of Tested System

Fig. 2-1 Configuration of Tested System



Table 2-1 Equipment Used in Tested System

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID

### 3.5. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 „Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Bontek Compliance Testing Laboratory Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Bontek laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10dB	(1)
Radiated Emission	1~12.75GHz	4.15dB	(1)
Conducted Disturbance	0.15~30MHz	3.20dB	(1)

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

### 3.6. Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Last Cal.	Due. Date
1	EMI Test Receiver	ROHDE & SCHWARZ	ESCI	2010/04/15	2011/04/14
2	Radio Communication Tester	ROHDE & SCHWARZ	CMU200	2010/04/15	2011/04/14
3	Dual Directional Coupler	Agilent	778D	2010/04/15	2011/04/14
4	10dB attenuator	SCHWARZBECK	MTAIMP-136	2010/04/15	2011/04/14
5	Tunable Bandreject filter	K&L	3TNF-800	2010/04/15	2011/04/14
6	Tunable Bandreject filter	K&L	5TNF-1700	2010/04/15	2011/04/14
7	High-Pass Filter	K&L	9SH10-2700/X12750-O/O	2010/04/15	2011/04/14
8	High-Pass Filter	K&L	41H10-1375/U12750-O/O	2010/04/15	2011/04/14
9	Coaxial Cable	Huber+Suhner	AC4-RF-H	2010/04/15	2011/04/14
10	AC Power Supply	IDRC	CF-500TP	2010/04/15	2011/04/14
11	DC Power Supply	IDRC	CD-035-020PR	2010/04/15	2011/04/14
12	RF Current Probe	FCC	F-33-4	2010/04/15	2011/04/14
13	Temperature /Humidity Meter	zhicheng	ZC1-2	2010/04/15	2011/04/14
14	MICROWAVE AMPLIFIER	HP	8349B	2010/04/15	2011/04/14
15	Amplifier	HP	8447D	2010/04/15	2011/04/14
16	SIGNAL GENERATOR	HP	8647A	2010/04/15	2011/04/14
17	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	2010/04/15	2011/04/14
18	Horn Antenna	Schwarzbeck	BBHA9120A	2010/04/15	2011/04/14
19	EMI Test Receiver	R&S	ESPI	2010/04/15	2011/04/14

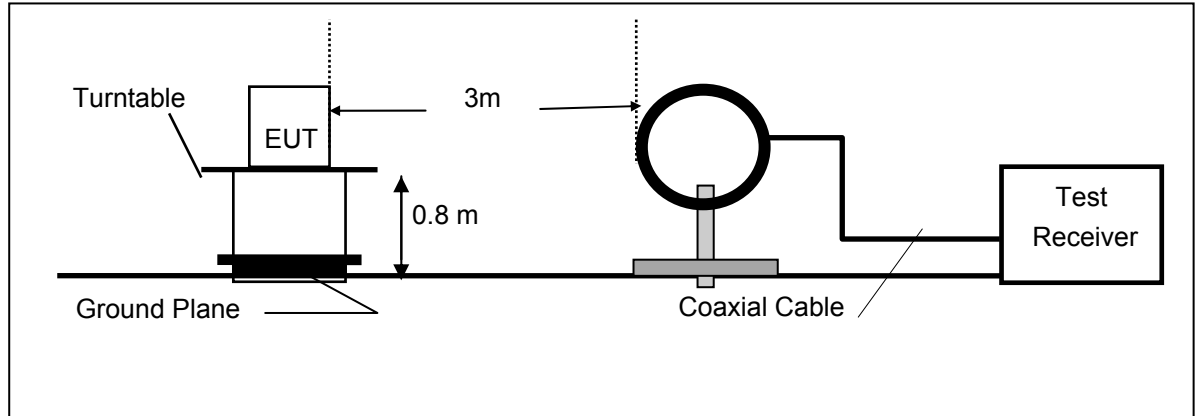


## 4. TEST CONDITIONS AND RESULTS

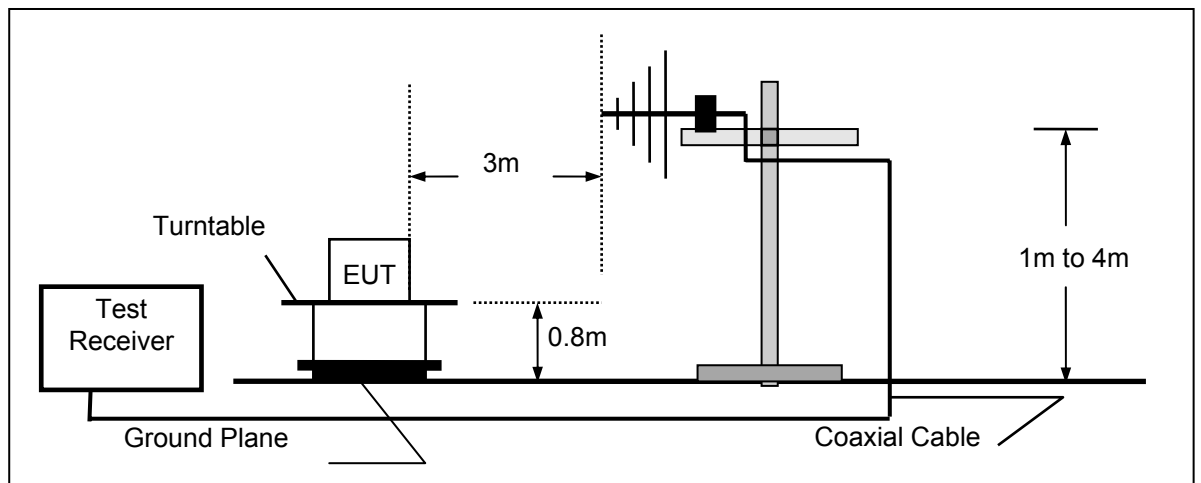
### 4.1. Radiated Emission Test

#### TEST CONFIGURATION

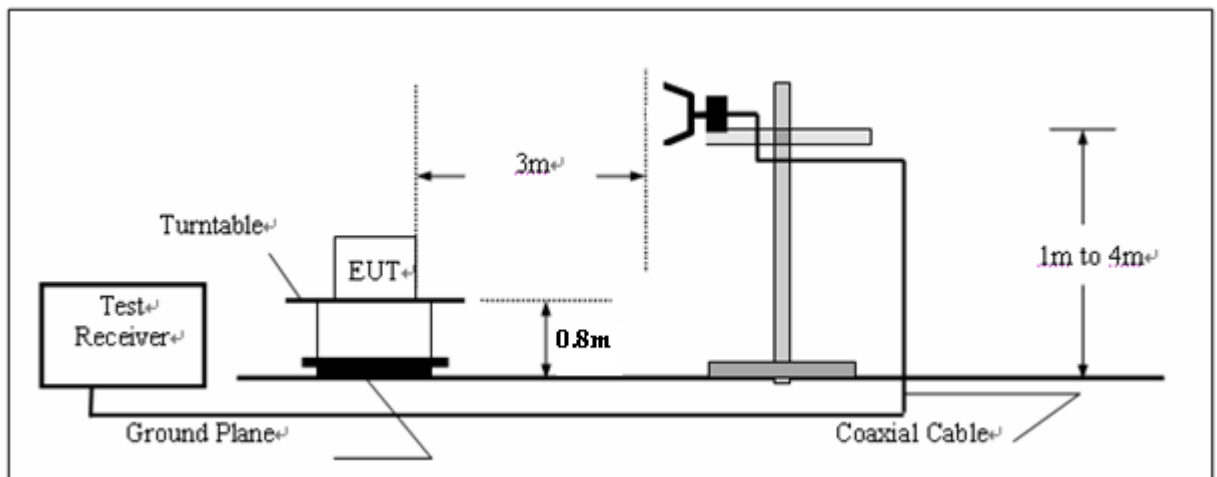
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



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



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



**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	

**RADIATION LIMIT**

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBµV/m)	Radiated (µV/m)
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

**Test Procedure**

1. The testing follows the guidelines in FCC Public Notice DA 00-705 Measurement Guidelines.
2. The EUT is placed on a turntable, which is 0.8m above ground plane.
3. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
4. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

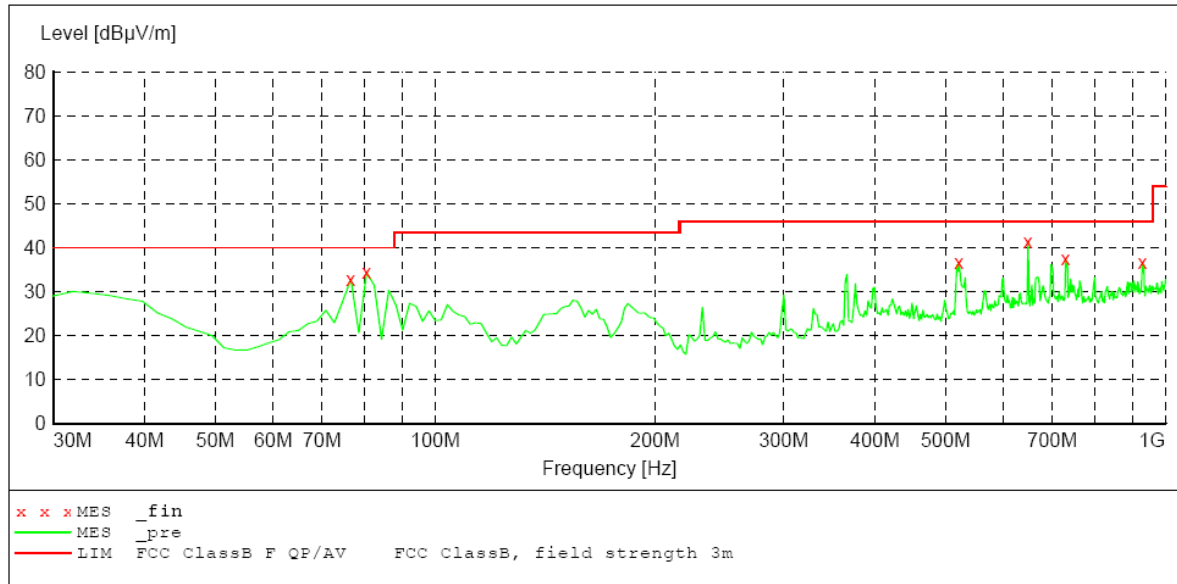
**Note: The test mode is Adapter 1# and 2# working together during the test. The test mode is the worst test results.**

**TEST RESULTS**

Below 1GHz Test Results:

**SCAN TABLE: "test Field(30M-1G)QP"**

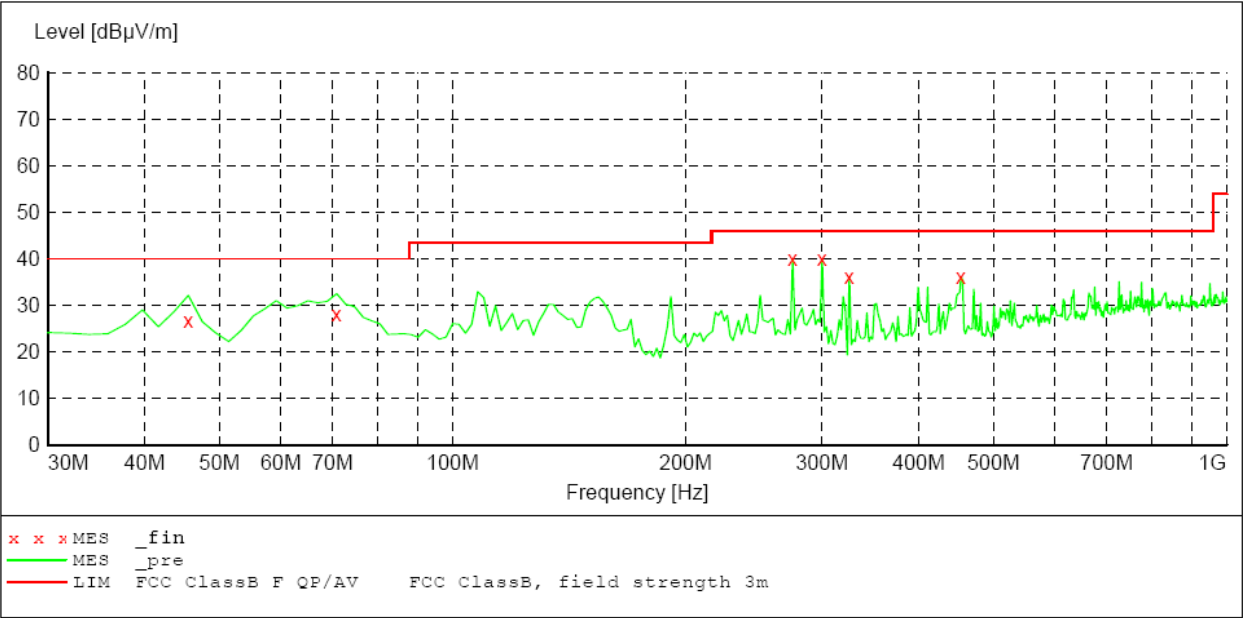
Short Description:		Field Strength(30M-1G)				
Start	Stop	Step	Detector	Meas.	IF	Transducer
Frequency	Frequency	Width		Time	Bandw.	
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562 10

**MEASUREMENT RESULT:**

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
76.650000	32.80	11.2	40.0	7.2	QP	300.0	197.00	HORIZONTAL
80.540000	34.40	11.4	40.0	5.6	QP	300.0	197.00	HORIZONTAL
521.800000	36.70	20.7	46.0	9.3	QP	100.0	140.00	HORIZONTAL
648.150000	41.30	23.4	46.0	4.7	QP	100.0	140.00	HORIZONTAL
729.790000	37.40	23.9	46.0	8.6	QP	100.0	210.00	HORIZONTAL
930.020000	36.70	25.5	46.0	9.3	QP	300.0	229.00	HORIZONTAL

SCAN TABLE: "test Field(30M-1G)QP"

Short Description:		Field Strength(30M-1G)					
Start	Stop	Step	Detector	Meas.	IF	Transducer	
Frequency	Frequency	Width		Time	Bandw.		
30.0 MHz	1.0 GHz	60.0 kHz	QuasiPeak	1.0 s	120 kHz	HL562 10	



MEASUREMENT RESULT:

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
45.550000	27.20	12.6	40.0	12.8	QP	300.0	158.00	VERTICAL
70.820000	28.50	10.7	40.0	11.5	QP	300.0	58.00	VERTICAL
274.920000	40.00	13.0	46.0	6.0	QP	100.0	209.00	VERTICAL
300.200000	40.00	13.8	46.0	6.0	QP	100.0	209.00	VERTICAL
325.470000	36.00	15.6	46.0	10.0	QP	100.0	209.00	VERTICAL
453.760000	36.10	20.1	46.0	9.9	QP	100.0	209.00	VERTICAL

## Above 1 GHz Test Results:

## Top Channel:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2480	V	Peak	86.40	-3.30	83.10	93.98	-10.88	F
2480	H	Peak	84.80	-3.30	81.50	93.98	-12.48	F
4960	V	Peak	47.40	3.90	51.30	73.98	-22.68	H
4960	H	Peak	40.90	3.90	44.80	73.98	-29.18	H
7440	V		---					H
7440	H		---					H
Others			---					

## Middle Channel:

Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2445	V	Peak	86.20	-3.40	82.80	93.98	-11.18	F
2445	H	Peak	84.70	-3.40	81.30	93.98	-12.68	F
4890	V	Peak	48.30	3.70	52.00	73.98	-21.98	H
4890	H	Peak	40.90	3.70	44.60	73.98	-29.38	H
7335	V		---					H
7335	H		---					H
Others			---					

## Bottom Channel:

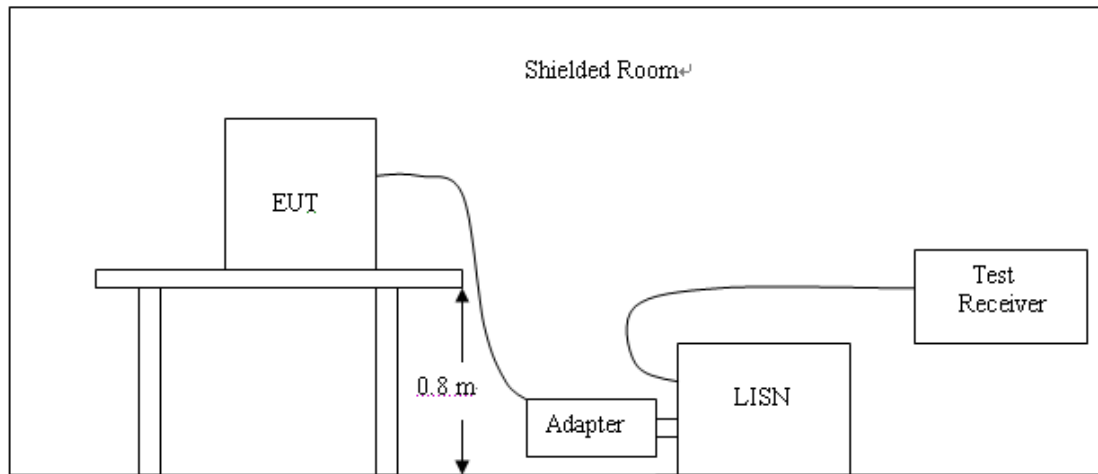
Freq. (MHz)	Ant.Pol. H/V	DetectorMode (PK/AV)	Reading (dBuV)	Ant./CL/ Amp. CF(dB)	Actual FS (dBuV/m)	Limit3m (dBuV/m)	Safe Margin (dB)	Note
2405	V	Peak	85.90	-3.50	82.40	93.98	-11.58	F
2405	H	Peak	85.10	-3.50	81.60	93.98	-12.38	F
4810	V	Peak	47.80	3.80	51.60	73.98	-22.38	H
4810	H	Peak	43.00	3.80	46.80	73.98	-27.18	H
7215	V		---					H
7215	H		---					H
Others			---					

## Remark:

- (1) Measuring frequencies from 30 MHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (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 EMI Test Receiver was 120KHz for measuring from 30 MHz to 1 GHz and 1 MHz for measuring above 1 GHz

## 4.2. Conducted Emissions Test

### TEST CONFIGURATION



### TEST PROCEDURE

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following:

Frequency (MHz)	Maximum RF Line Voltage (dBµV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

\* Decreasing linearly with the logarithm of the frequency

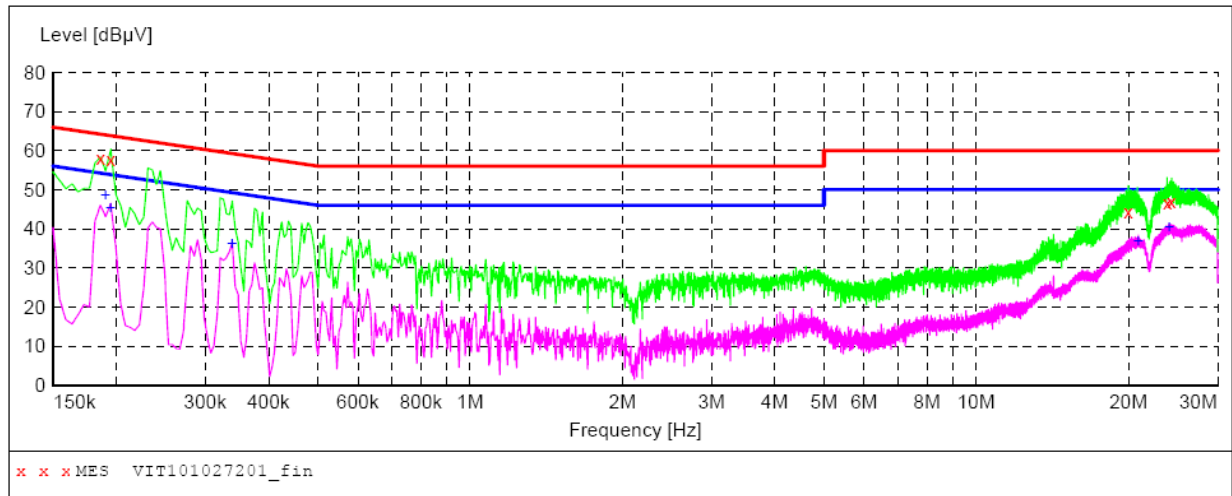
For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

1. Please follow the guidelines in ANSI C63.4-2003.
2. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connecting to the other LISN.
5. The LISN provides 50 ohm coupling impedance for the measuring instrument.
6. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
7. Both sides of AC line were checked for maximum conducted interference.
8. The frequency range from 150 kHz to 30 MHz was searched.
9. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

**The RBW/VBW for 150KHz to 30MHz: 9KHz**

**TEST RESULTS****Adapter 1#:****SCAN TABLE: "Voltage (9K-30M) FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "VIT101027201\_fin"**

10/27/2010 20:25

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.186000	58.20	9.9	64	6.0	QP	L1	GND
0.195000	57.70	9.9	64	6.1	QP	L1	GND
19.959000	44.30	9.8	60	15.7	QP	L1	GND
23.887500	46.70	9.6	60	13.3	QP	L1	GND
24.301500	46.90	9.6	60	13.1	QP	L1	GND

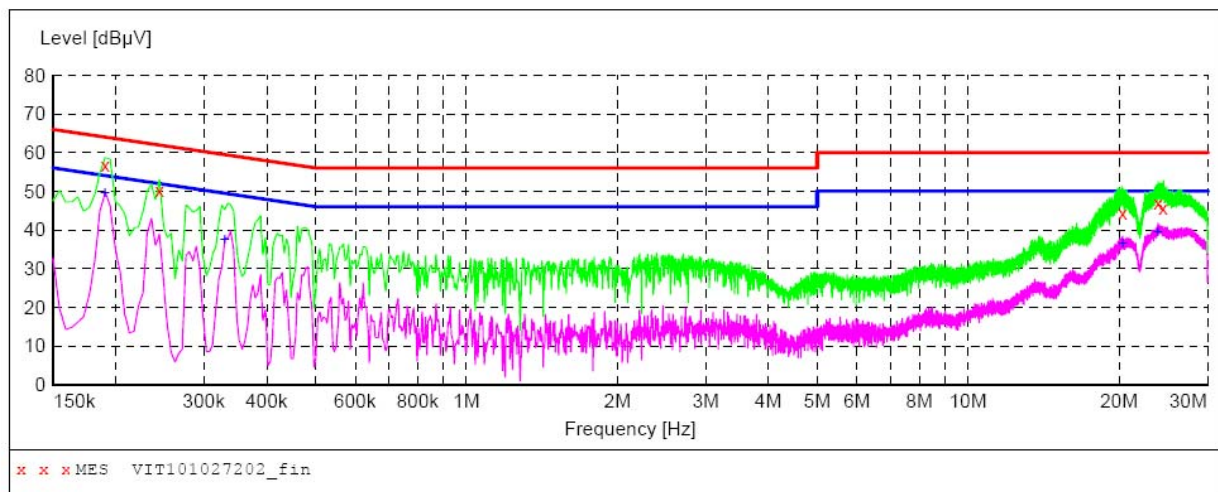
**MEASUREMENT RESULT: "VIT101027201\_fin2"**

10/27/2010 20:25

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.190500	48.60	9.9	54	5.4	AV	L1	GND
0.195000	45.40	9.9	54	8.4	AV	L1	GND
0.339000	36.10	10.0	49	13.1	AV	L1	GND
20.913000	36.80	9.7	50	13.2	AV	L1	GND
24.085500	40.40	9.6	50	9.6	AV	L1	GND

**SCAN TABLE: "Voltage (9K-30M)FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "VIT101027202\_fin"**

10/27/2010 20:28

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.190500	56.60	9.9	64	7.4	QP	N	GND
0.244500	50.10	9.9	62	11.8	QP	N	GND
20.305500	44.40	9.8	60	15.6	QP	N	GND
23.914500	46.90	9.6	60	13.1	QP	N	GND
24.504000	45.80	9.6	60	14.2	QP	N	GND

**MEASUREMENT RESULT: "VIT101027202\_fin2"**

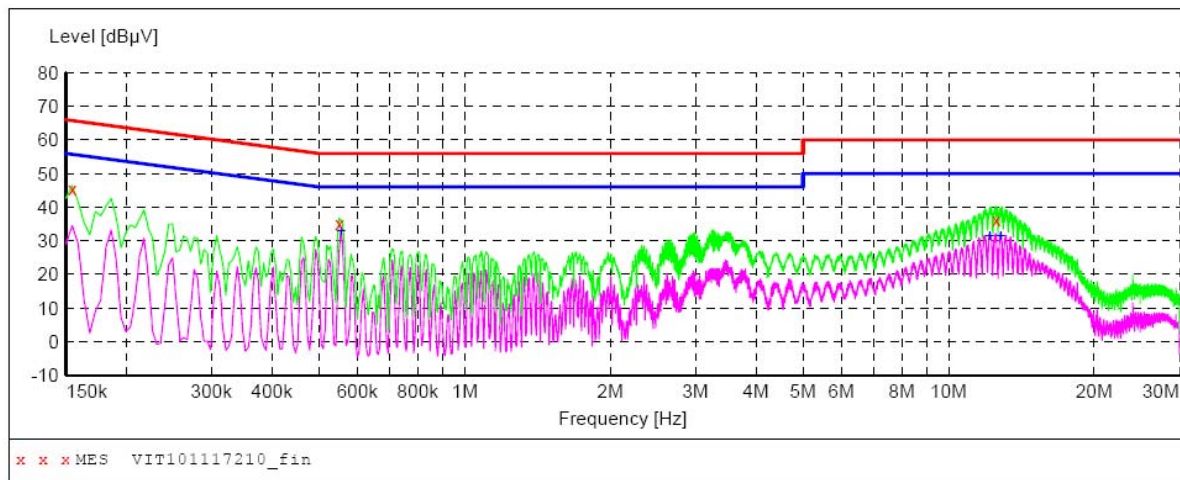
10/27/2010 20:28

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.190500	49.50	9.9	54	4.5	AV	N	GND
0.330000	37.70	10.0	50	11.8	AV	N	GND
20.350500	36.40	9.8	50	13.6	AV	N	GND
23.914500	39.60	9.6	50	10.4	AV	N	GND



**Adapter 2#:****SCAN TABLE: "Voltage (9K-30M) FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "VIT101117210\_fin"**

11/17/2010 21:26

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.154500	45.40	9.9	66	20.4	QP	N	GND
0.550500	35.10	9.9	56	20.9	QP	N	GND
12.538500	36.30	9.9	60	23.7	QP	N	GND

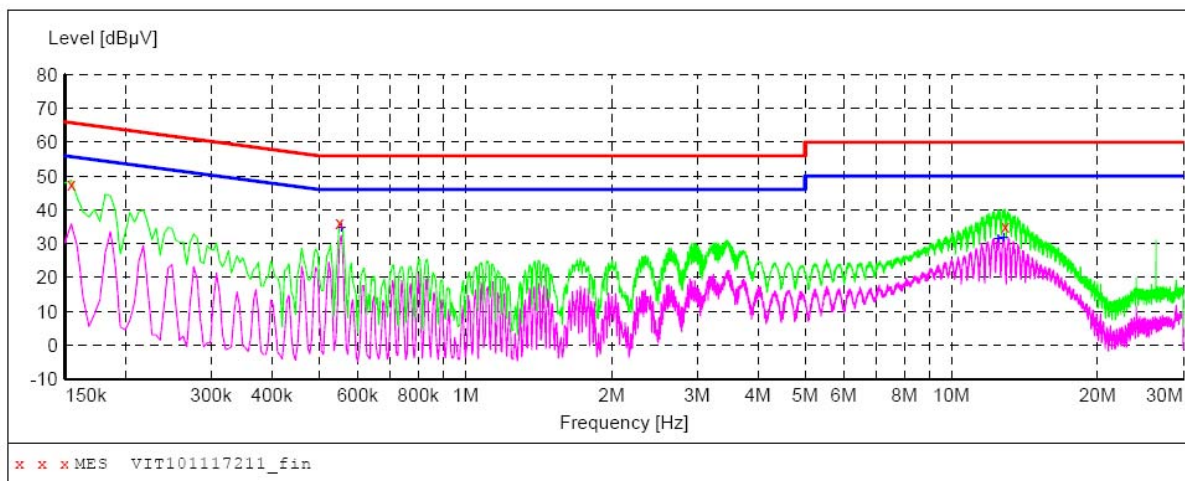
**MEASUREMENT RESULT: "VIT101117210\_fin2"**

11/17/2010 21:26

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.555000	33.10	9.9	46	12.9	AV	N	GND
12.160500	31.40	10.0	50	18.6	AV	N	GND
12.799500	31.60	9.9	50	18.4	AV	N	GND

**SCAN TABLE: "Voltage (9K-30M) FIN"**

Short Description: 150K-30M Voltage

**MEASUREMENT RESULT: "VIT101117211\_fin"**

11/17/2010 21:28

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.154500	47.60	9.9	66	18.2	QP	L1	GND
0.550500	36.40	9.9	56	19.6	QP	L1	GND
12.885000	35.30	9.9	60	24.7	QP	L1	GND

**MEASUREMENT RESULT: "VIT101117211\_fin2"**

11/17/2010 21:28

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.555000	34.80	9.9	46	11.2	AV	L1	GND
12.471000	31.50	9.9	50	18.5	AV	L1	GND
12.799500	31.70	9.9	50	18.3	AV	L1	GND

.....End of Report.....