

CFR 47 FCC Part 15.249

TEST REPORT

Product : **RF 2.4G Wireless Keyboard**

Trade Name : N/A

Model Number : PSK-4971; ASK-4971; KSK-3211 RFM; KB178RT

FCC ID : RAC4971A01

Prepared for

PRECISION SQUARED TECHNOLOGY CORPORATION

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Remark :

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The test results in the report only to the tested sample.

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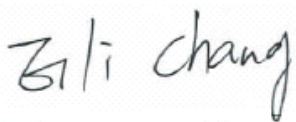
Statement of Compliance

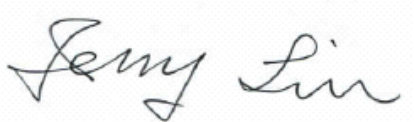
Applicant: PRECISION SQUARED TECHNOLOGY CORPORATION
Manufacturer: JING MOLD ELECTRONIC TECHNOLOGY (SHEN ZHEN) CO., LTD.
Product: RF 2.4G Wireless Keyboard
Model No.: PSK-4971; ASK-4971; KSK-3211 RFM; KB178RT
Tested Power Supply: DC 3V
Date of Final Test: Jul. 08, 2011
Revision of Report: Rev. 01
Configuration of Measurements and Standards Used :
FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.4, and the energy emitted by the device was founded to be within the limits applicable. I assume full responsibility for accuracy and completeness of these data.

Note: 1. The result of the testing report relate only to the item tested.
2. The testing report shall not be reproduced expect in full, without the written approval of IETC

Report Issued: 2011/09/01

Project Engineer: 
Elli Chang

Approved: 
Jerry Liu

1 General Information

1.1 Description of Equipment Under Test

Product	: RF 2.4G Wireless Keyboard
Model Number	: PSK-4971; ASK-4971; KSK-3211 RFM; KB178RT
Applicant	: PRECISION SQUARED TECHNOLOGY CORPORATION 5F-7, NO.2 JIAN BA ROAD, CHUNG HO CITY, TAIPEI HSIENG, TAIWAN, R.O.C.
Manufacturer	: JING MOLD ELECTRONIC TECHNOLOGY (SHEN ZHEN) CO., LTD. Xinqiao, 3rd Industrial Zone, Shajing Town, Paoan District, Shenzhen City, Guangdong Province. China, Shenzhen, Guangdong, China.
Operating Frequency	: 2405MHz ~ 2477MHz
Channel Number	: Refer to section 1.2
Type of Modulation	: GFSK
Antenna description	: This device uses PCB Print antenna. The antenna is integral to the device, thereby meeting the requirement of FCC 15.203.
Date of Test	: Jun. 17 ~Jul. 08, 2011
Additional Description	: 1. The model PSK-4971 is representative selected in the test and included in this report. 2. The difference between all model included in this report is for different market; the rest parts are identical. 3. For more detail specification about EUT, please refer to the user's manual.

1.2 Table for Carrier Frequencies

CH No.	1	2	3	4	5	6	7	8	9	10	11
CF (MHz)	2405	2409	2413	2417	2421	2425	2429	2433	2437	2441	2445

CH No.	12	13	14	15	16	17	18	19
CF (MHz)	2449	2453	2457	2461	2465	2469	2473	2477

1.3 Details of Tested Supporting System

1.3.1 Personal Computer

PC26

Model Number : ASUS-BM5320
CPU Speed : Intel Core2 Duo E5200
EMC Compliance : BSMI R31018
Manufacturer : ASUS
RAM : Anya 1G DDR2 800
Hard Disk Driver : Seagate ST32500310AS 250G
Switching Power Supply : Detal GPS-300AB C 300W
Power Cord : Non-shielded, Detachable, 1.8m, w/o core

1.3.2 Monitor

MT25

Model Number : CMV 92GH 19"
Serial Number : P2GHAGCN P120376
EMC Compliance : FCC, CE, BSMI: R31374, UL, TUV
Manufacturer : CHIMEI
Power Cord : Non-shielded, Detachable, 1.8m, w/o core
D-Sub Cable : Non-shielded, Detachable, 1.8m, with core

1.3.3 Mouse

USB35

Model Number : M-UV83
Serial Number : LNA34511454
EMC Compliance : FCC, CE, BSMI R41126
Manufacturer : LOGITECH
Data Cable : Non-shielded, Un-detachable, 1.8m

1.3.4 Modem

MD01

Model Number : 3240491130
Serial Number : 211-28E1-1100-3
EMC Compliance : N/A
Manufacturer : DATATRONICS
Data Cable : Shielded, Detachable, 1.5m
Power Adapter : Amigo, Model AM-12830A
Non-Shielded, Detachable, 1.8m

1.3.5 Printer

PR04

Model Number : C20SX
Serial Number : DW4Y038113
EMC Compliance : BSMI 3902E004
Manufacturer : EPSON
Data Cable : Shielded, Detachable, 1.8m
Power Cord : Non-shielded, Un-detachable, 1.8m

1.3.6 Dongle

Model Number : PSX-2302
Manufacturer : PERCISION

1.4 Test Facility

- Site Description** : ☑Conduction 2 ☑OATS 2
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Site 1, 2, 3 Location** : No.5-2, Lin 1, Tin-Fu Tsun, Lin-Kou Hsiang,
Taipei County, Taiwan, R.O.C.
- Site Filing** :
- Federal Communication Commissions – USA
Registration No.: 96399 (OATS 1 & 2)
Registration No.: 518958 (OATS 3)
Designation No.: TW1020
 - Voluntary Control Council for Interference by Information
Technology Equipment (VCCI) – Japan
Member No.: 1349
Registration No. (Conducted Room): C-1094
Registration No. (Conducted Room): T-1562
Registration No. (OATS 1): R-1040; G-274
Registration No. (OATS 2): R-1041
 - Industry Canada (IC)
OUR FILE: 46405-4437 Submission: 145171
Registration No. (OATS 1): Site# 4437A-1
Registration No. (OATS 2): Site# 4437A-2
Registration No. (OATS 3): Site# 4437A-3
- Site Accreditation** :
- Bureau of Standards and Metrology and Inspection (BSMI) –
Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS13438 / CISPR22
SL2-R1-E-0026 for CNS13439 / CISPR13
SL2-R2-E-0026 for CNS13439 / CISPR13
SL2-A1-E-0026 for CNS13783-1 / CISPR14-1
SL2-L1-E-0026 for CNS 14115 / CISPR 15
 - Taiwan Accreditation Foundation (TAF)
Accrditation No.: 1113
 - TÜV NORD
Certificate No: TNTW0801R-03



1.5 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSP30	100002	2012/01/02
Preamplifier	Agilent	8449B	3008A01434	2012/04/28
Cable	HARBOUR	27478LL142	CBL22	2011/09/28
Cable	HARBOUR	27478LL142	CBL23	2011/09/28
Horn Antenna	Schwarzbeck	BBHA 9120	9120D-583	2013/05/01
Horn Antenna	COM-POWER	AH-118	10081	2012/05/19
Horn Antenna	Schwarzbeck	BBHA 9170	213	2012/07/19
Temp & Humidity chamber	GIAN FORCE	GTH-150-40-2P-U	MAA0305-012	2013/05/24
EMI Test Receiver	R&S	ESCS30	100127	2011/09/08
Biconical Antenna	Schwarzbeck	BBA 9106	VHA 9103-2419	2012/03/29
Log Antenna	Schwarzbeck	UHALP 9108 A	0739	2012/03/29
Pre-Amplifier	SCHAFFNER	CPA9231A	3349	2011/08/03
RF Cable	IETC	8DFB	CBL14	2011/07/14
EMI Test Receiver	R&S	ESCS30	100134	2011/07/20
RF Cable	HARBOUR	RG-58/U	CBL40	2011/11/10
L.I.S.N.	Schaffner	MN2050D	1597	2013/06/20
L.I.S.N.	R&S	ESH3-Z5	829996/016	2013/01/02

Note: The above equipments are within the valid calibration period.

1.6 Summary of Measurement

Report Clause	Test Parameter	Reference Document CFR47 Part15	Results
2	20dB Bandwidth test	§15.215	Pass
3	RF Radiated spurious emission test	§15.249(a)(c)(d)	Pass
4	Emission on the Band Edge	§15.249(d)	Pass
5	AC Power Line Conducted Emission test	§15.207	Pass

1.7 Justification

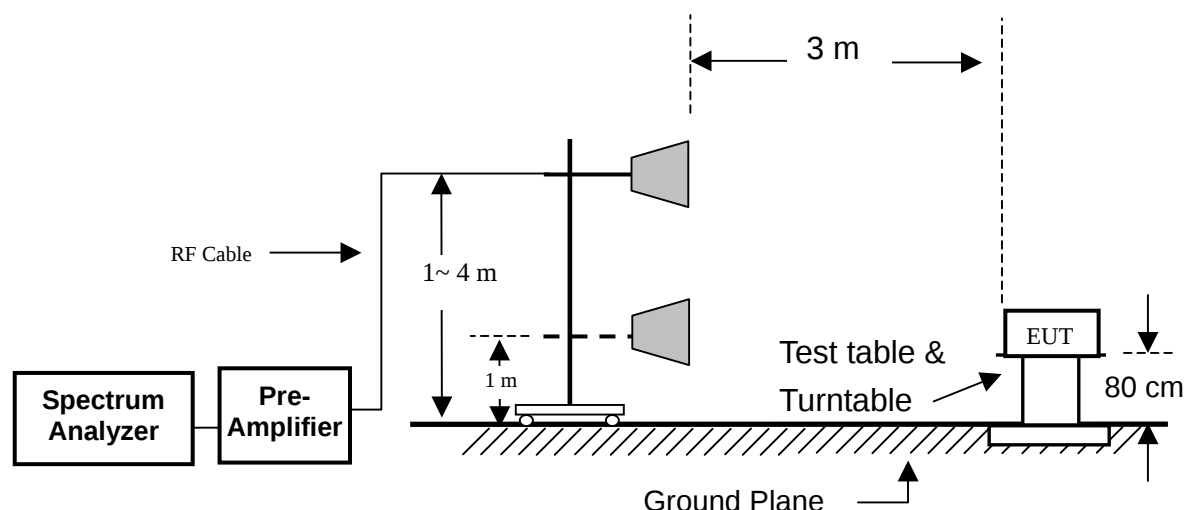
The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of the frequency band were all arrive limit requirement, thus we evaluate the EUT pass the specified test.

2 20dB Bandwidth test

2.1 Limit

According to FCC 15.215 requirement, there was no regulation limit and for reference purpose.

2.2 Configuration of Measurement



2.3 Test Procedure

The 20dB bandwidth per FCC §15.215 was measured using spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth $\geq$ RBW, and the SPAN may equal to approximately 2 to 3 time the 20dB bandwidth.

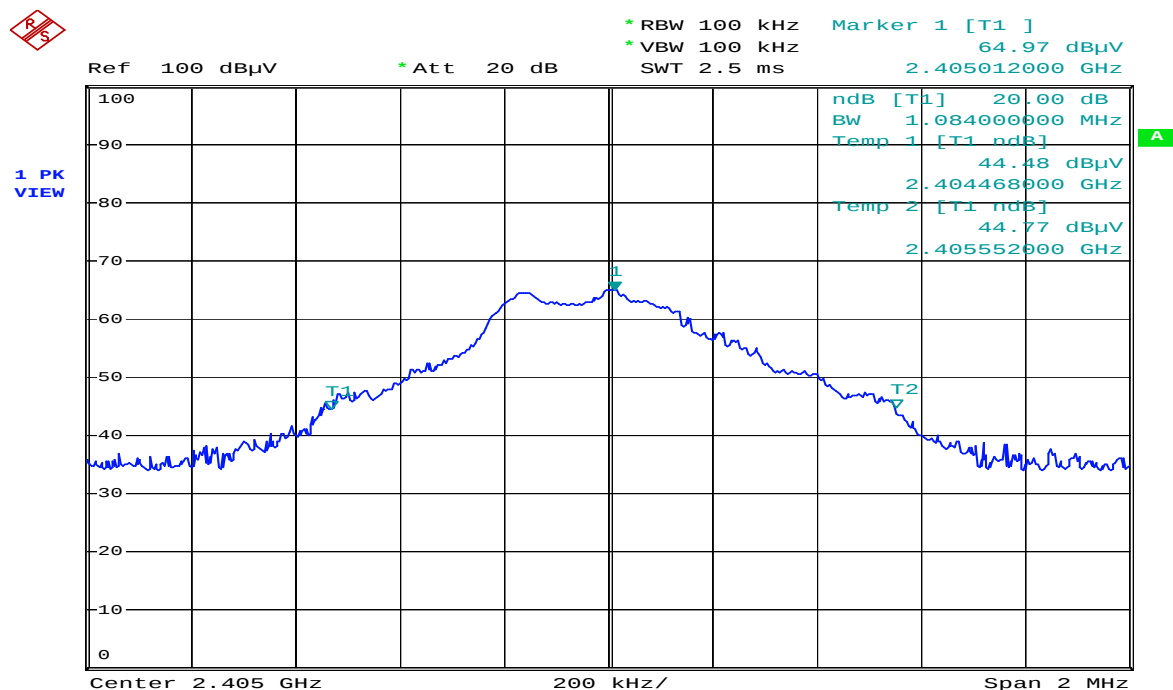
2.4 Test Result

PASS.

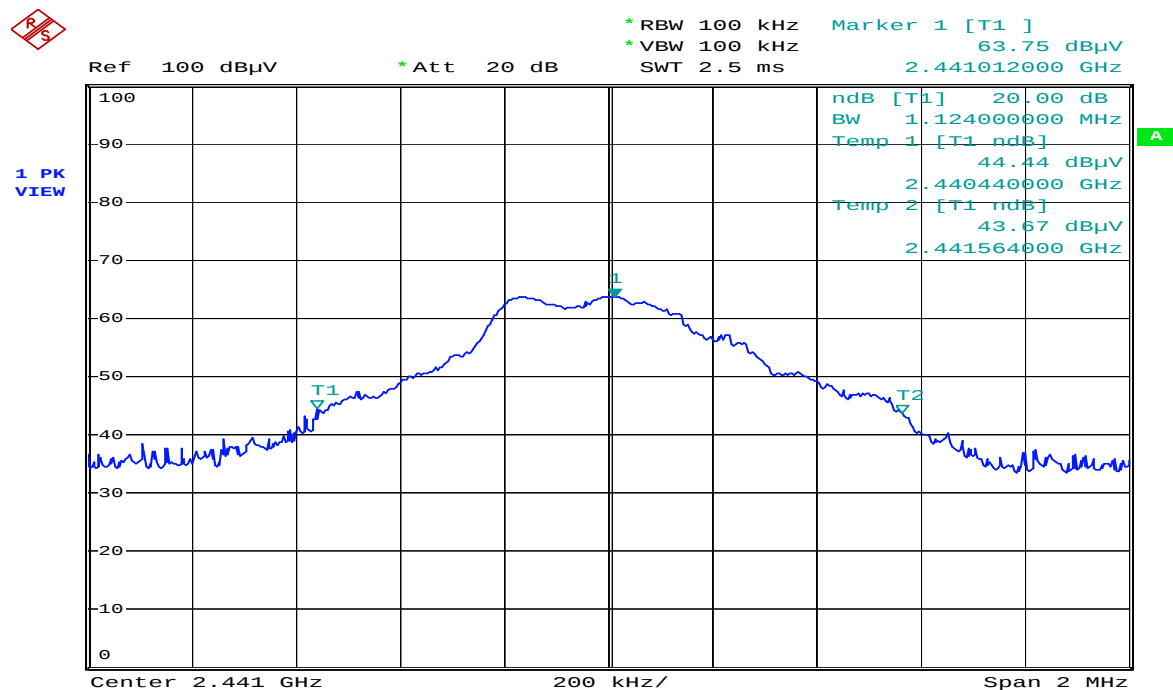
The final test data is shown as following pages.

Test CH		20dB Bandwidth (MHz)
Modulation	Frq. (MHz)	
GFSK	2405	1.084
	2441	1.124
	2477	1.092

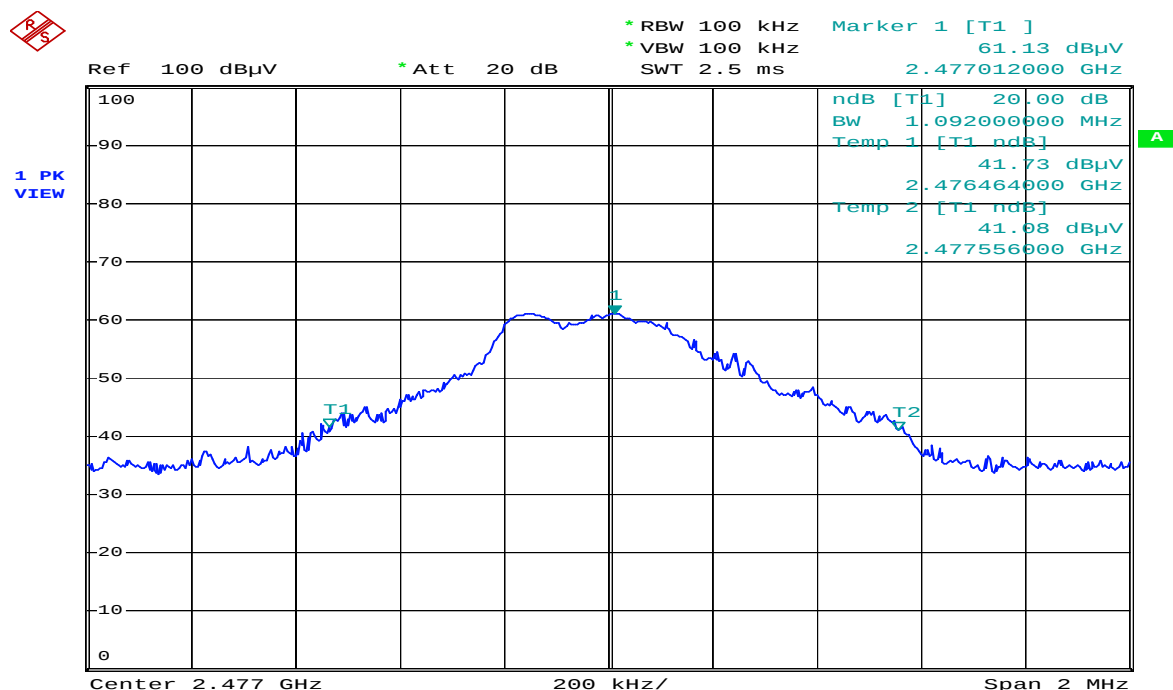
2405MHz 20dB BW



2441MHz 20dB BW



2477MHz 20dB BW



3 RF Radiated spurious emission test

3.1 Limit

According to §15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

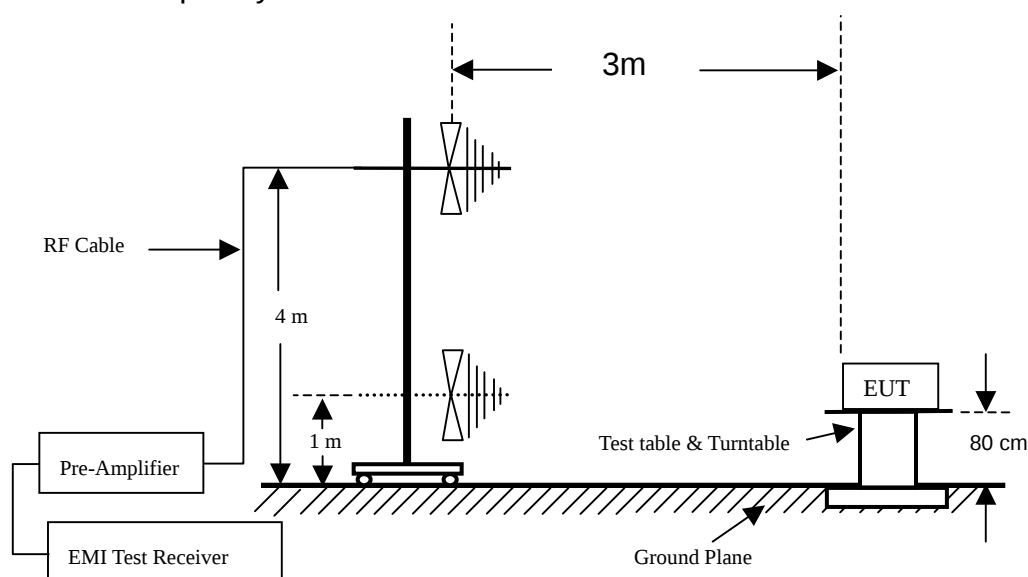
Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

For intentional radiator, the radiated emission shall comply with §15.209(a).

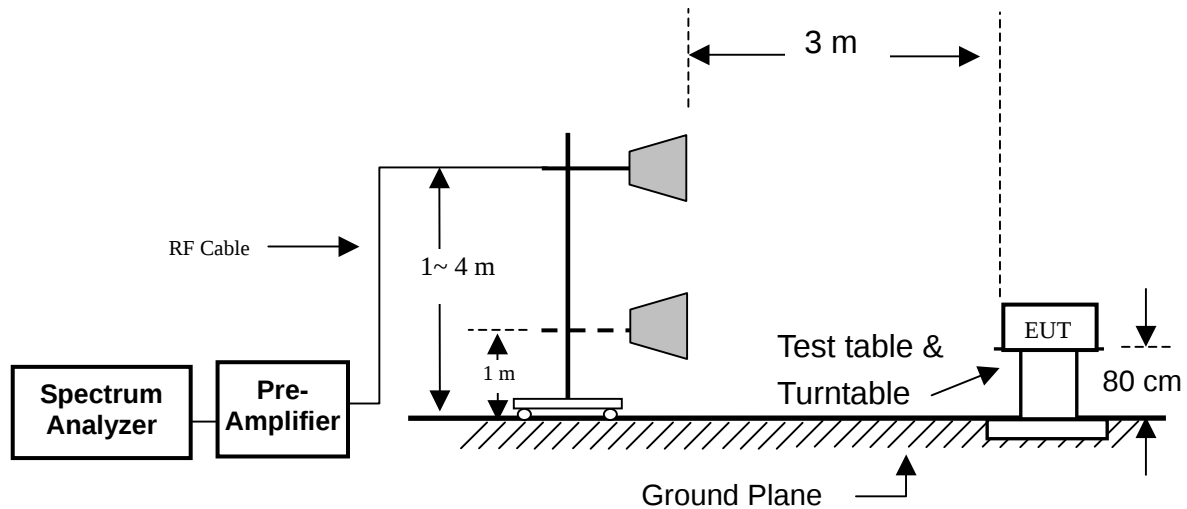
Frequency (MHz)	Field strength dB(μ V/m)	Measurement distance (meters)
1.705~30.0	29.5	30
30 ~ 88	40	3
88~216	43.5	3
216~960	46	3
Above 960	54	3

3.2 Configuration of Measurement

Measurement Frequency under 1GHz



Measurement Frequency above 1GHz



3.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003.

Radiated emission measurements were performed from 30MHz to 25GHz. Spectrum Analyzer set as below: For frequency range from 30MHz to 1GHz: RBW=100kHz or greater. For frequencies above 1GHz: set RBW=VBW=1MHz for peak detector and RBW=1MHz, VBW=10Hz for average detector.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

3.4 The description of operation mode

Setup EUT to continuously transmit signal with 100% duty cycle during the test period.

3.5 Test Result

PASS.

The final test data is shown on as following pages.

Radiated spurious emission

Fundamental Emissions

Low channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
2405	H	75.10	26.28	31.75	80.57	94	-13.43	PK
2405	V	73.07	26.28	31.75	78.54	94	-15.46	PK

Middle channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
2441	H	72.68	26.29	31.84	78.23	94	-15.77	PK
2441	V	71.77	26.29	31.84	77.32	94	-16.68	PK

High channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
2477	H	72.56	26.30	31.94	78.20	94	-15.80	PK
2477	V	70.89	26.30	31.94	76.53	94	-17.47	PK

Remark :

1. Corrected Level = Reading – Preamp + Correction Factor
2. Correction Factor = Antenna Factor + Cable Loss

Radiated spurious emission

Test Environment

Ambient temperature : 25.5°C

Relative humidity : 47%

Radiated Emission below 1GHz

After verifying low, middle and high channel (2405MHz, 2441MHz and 2477MHz), the worse case was found at low channel, the data will present on report.

Worst case: Low channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
56.000	H	50.23	33.30	10.08	27.01	40.00	-12.99	QP
116.350	H	48.65	33.00	13.22	28.87	43.52	-14.65	QP
168.690	H	45.96	33.39	16.84	29.41	43.52	-14.11	QP
256.620	H	46.85	33.47	20.41	33.79	46.02	-12.23	QP
350.230	H	45.65	33.60	17.64	29.69	46.02	-16.33	QP
405.230	H	43.20	34.00	19.96	29.16	46.02	-16.86	QP
45.630	V	48.29	33.20	12.52	27.61	40.00	-12.39	QP
123.610	V	46.32	33.04	14.82	28.10	43.52	-15.42	QP
152.160	V	45.65	33.22	17.32	29.75	43.52	-13.77	QP
254.320	V	44.96	33.44	20.60	32.12	46.02	-13.90	QP
354.870	V	45.65	33.60	17.65	29.70	46.02	-16.32	QP
389.590	V	45.00	33.99	19.27	30.28	46.02	-15.74	QP

Remark : Corrected Level = Reading + Correction Factor – Preamplifier

Correction Factor = Antenna Factor + Cable Loss

The present spurious only show those points are above noise level and the frequency range test from 30MHz to 1GHz.

Radiated spurious emission

Radiated Emission above 1GHz

Low Channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
4810	H	41.54	26.04	37.37	52.87	54	-1.13	PK
7215	H	35.35	25.77	42.84	52.42	54	-1.58	PK
*9620	H	31.23	25.60	46.88	52.51	54	-1.49	PK
4810	V	40.56	26.04	37.37	51.89	54	-2.11	PK
7215	V	35.65	25.77	42.84	52.72	54	-1.28	PK
*9620	V	31.52	25.60	46.88	52.80	54	-1.20	PK

Middle Channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
4882	H	41.30	26.02	37.57	52.85	54	-1.15	PK
7323	H	35.46	25.71	43.17	52.92	54	-1.08	PK
*9764	H	31.35	25.60	47.34	53.09	54	-0.91	PK
4882	V	41.23	26.02	37.57	52.78	54	-1.22	PK
7323	V	34.96	25.71	43.17	52.42	54	-1.58	PK
*9764	V	31.05	25.60	47.34	52.79	54	-1.21	PK

High Channel								
Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Preamplifier (dB)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
4954	H	39.76	26.01	37.77	51.52	54	-2.48	PK
7431	H	35.25	25.64	43.49	53.10	54	-0.90	PK
*9908	H	31.21	25.60	47.80	53.41	54	-0.59	PK
4954	V	40.65	26.01	37.77	52.41	54	-1.59	PK
7431	V	35.09	25.64	43.49	52.94	54	-1.06	PK
*9908	V	31.17	25.60	47.80	53.37	54	-0.63	PK

Remark : Corrected Level = Reading + Correction Factor – Preamplifier

Correction Factor = Antenna Factor + Cable Loss

* Mark indicated background noise level.

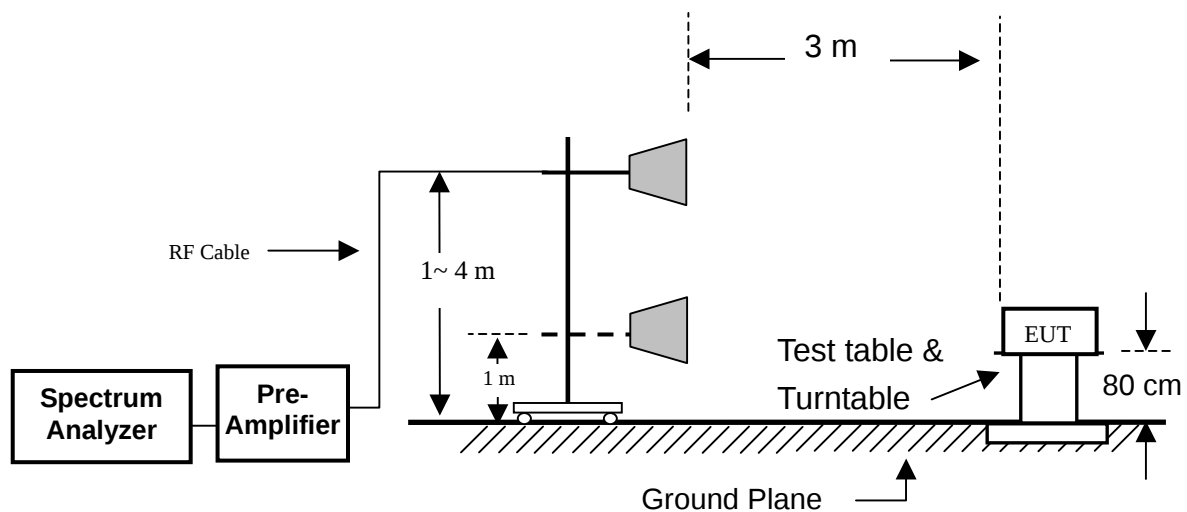
4 Emission on the Band Edge test

4.1 Limit

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

4.2 Configuration of Measurement

Measurement Frequency above 1GHz



4.3 Test Procedure

The EUT was setup to ANSI C63.4, 2003.

Set RBW =1M, VBW= RBW for peak, and VBW=10Hz for average.

The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meter and down to 1 meter.

4.4 Test Result

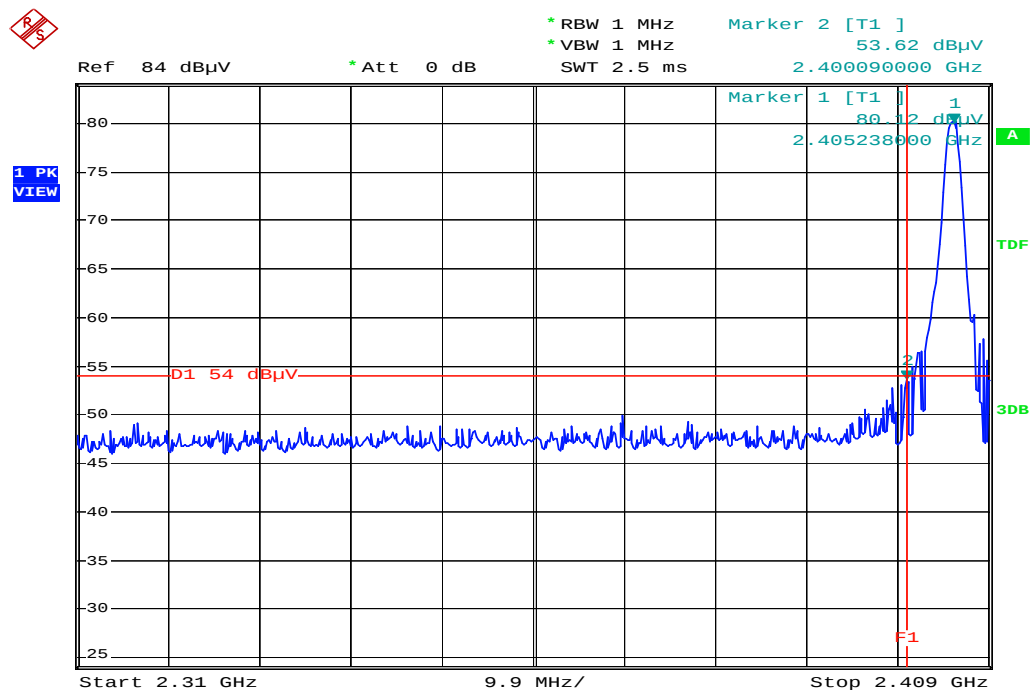
PASS.

The final test data is shown on as following pages.

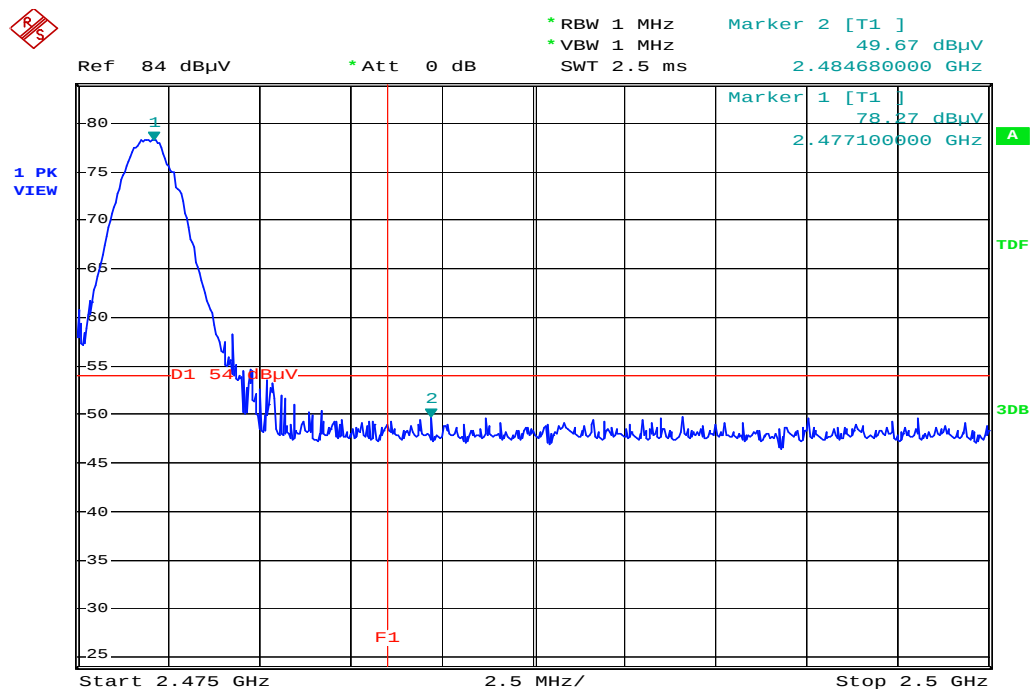
Band edge

Frequency	Restrict Freq. Band (MHz)	Maximum level (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Detector Mode
2405	2310~2400	53.62	54	-0.38	PK
2477	2483.5~2500	49.67	54	-4.33	PK

2405MHz PK



2477MHz PK



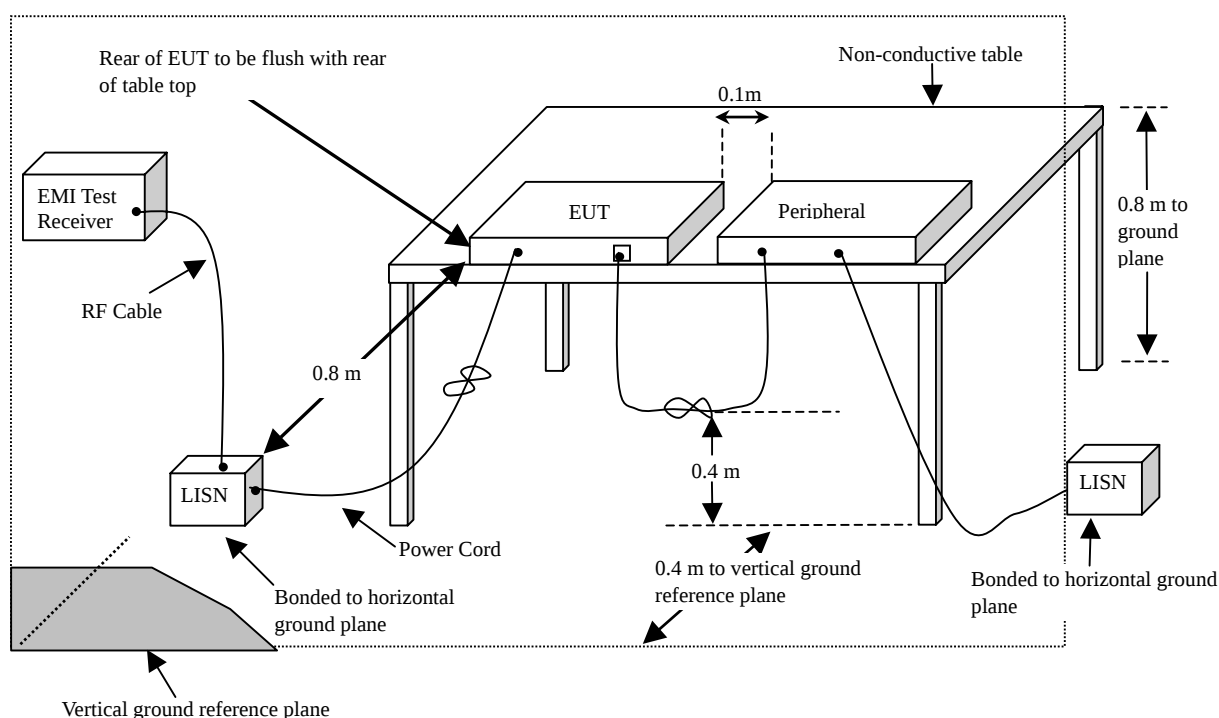
5 AC Power Line Conducted Emission test

5.1 Limits

Frequency (MHz)	Quasi-Peak (dB μ V)	Average (dB μ V)
0.15 to 0.5	66 to 56	56 to 46
> 0.5 to 5	56	46
> 5 to 30	60	50

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

5.2 Configuration of Measurement



5.3 Test Procedures

- 1) The EUT was placed 80cm height above ground on a non-conductive table and vertical conducting plane located 40cm to the rear of the EUT.
- 2) The EUT was connected to the main power through Line Impedance Stabilization Networks (LISN). This setup provided a 50ohm/50mH coupling impedance for the measuring equipment. The auxiliary equipment will place in secondary LISN.
- 3) Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.

5.4 Test Result

PASS.

The final test data is shown as following pages.

Power Line Conducted Test Data

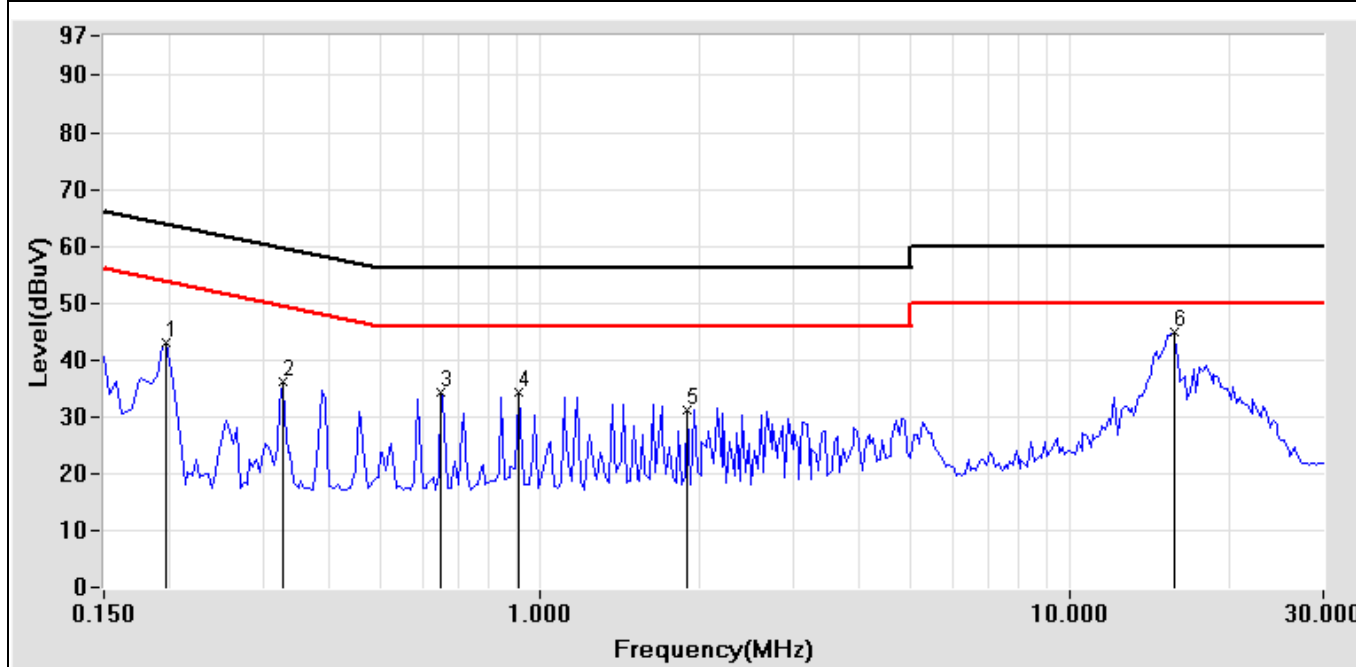
EUT: RF 2.4G Wireless Keyboard
CLIENT: PRECISION
MODEL: PSK-4971
RATING: From PC
Temperature: 25.8 °C
Humidity: 52 %

POLARITY: Line
DISTANCE:
Serial No.:
FILE/DATA#: PRECISION.emi/24
OPERATOR: Elli
TEST SITE: Conduction 2

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.197	0.17	41.92	40.51	42.09	40.68	63.74	53.74	-21.65	-13.06
0.326	0.16	33.16	31.57	33.32	31.73	59.55	49.55	-26.23	-17.82
0.650	0.16	32.60	30.81	32.76	30.97	56.00	46.00	-23.24	-15.03
0.912	0.17	32.75	31.82	32.92	31.99	56.00	46.00	-23.08	-14.01
1.888	0.13	29.65	28.50	29.78	28.63	56.00	46.00	-26.22	-17.37
15.666	0.75	38.96	29.79	39.71	30.54	60.00	50.00	-20.29	-19.46

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Working Mode

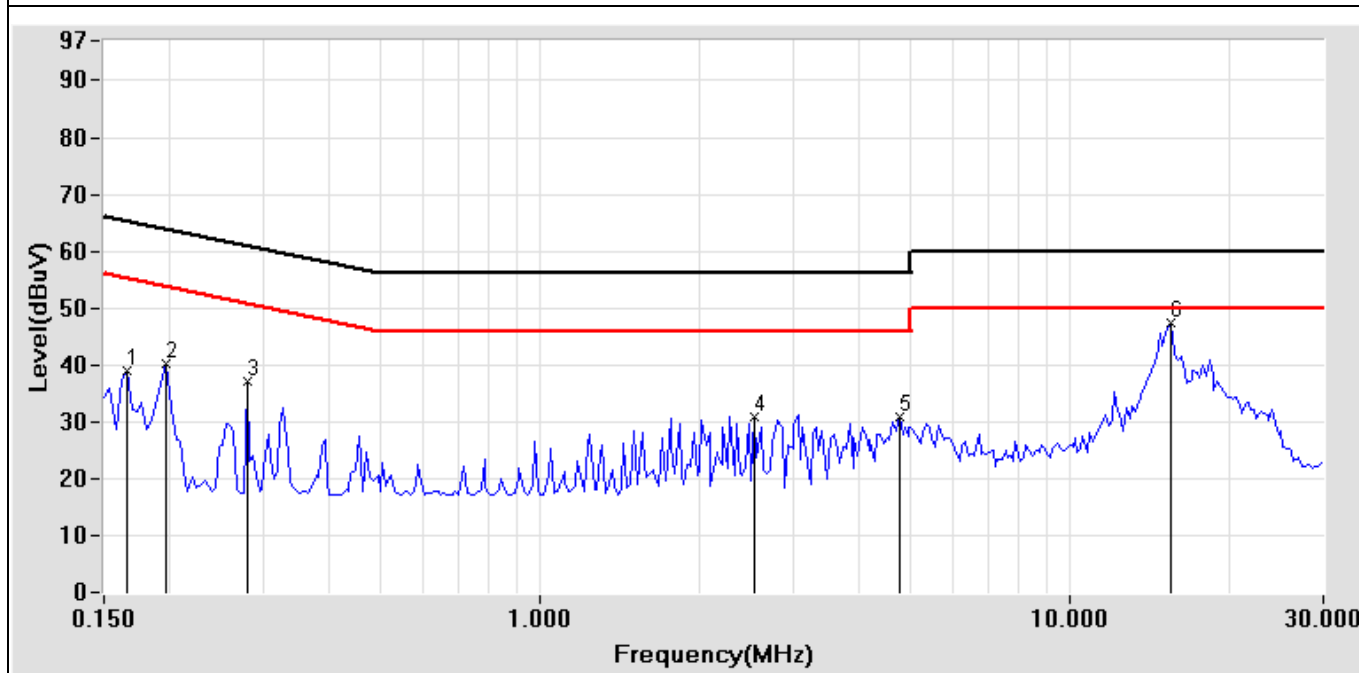
Power Line Conducted Test Data

EUT: RF 2.4G Wireless Keyboard	POLARITY: Neutral
CLIENT: PRECISION	DISTANCE:
MODEL: PSK-4971	Serial No.:
RATING: From PC	FILE/DATA#: PRECISION.emi/25
Temperature: 25.8 °C	OPERATOR: Elli
Humidity: 52 %	TEST SITE: Conduction2

Frequency (MHz)	Factor (dB)	Meter Reading (dBμV)		Emission Level (dBμV)		Limits (dBμV)		Margin (dB)	
		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
0.166	0.20	36.69	34.49	36.89	34.69	65.16	55.16	-28.27	-20.47
0.197	0.18	39.00	38.05	39.18	38.23	63.74	53.74	-24.56	-15.51
0.279	0.18	31.81	25.21	31.99	25.39	60.85	50.85	-28.86	-25.46
2.541	0.11	28.87	27.00	28.98	27.11	56.00	46.00	-27.02	-18.89
4.755	0.27	27.96	23.91	28.23	24.18	56.00	46.00	-27.77	-21.82
15.420	0.85	37.13	28.39	37.98	29.24	60.00	50.00	-22.02	-20.76

Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.



Test Mode: Working Mode