

47 CFR Part 15 Subpart C

Section 15.209

Test Report

Product : **Diagnostic Tool**

Trade Name : N/A

Model Number : DT-083001

FCC ID : 2AORY-DT821

Prepared for

KUANHAUR TECHNOLOGIES CO., LTD.

6F.-2, NO.305, SEC. 3, ZHONGXIAO E. RD., DA-AN DIST.,

TAIPEI CITY 10654, Taiwan

TEL.: 0930858557

FAX.: +886 2 2981 3823

Prepared by

Interocean EMC Technology Corp.

Interocean EMC Technology Tin-Fu Laboratory

No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City,

Taiwan 244, R.O.C.

TEL.: +886 2 2600 6861

FAX.: +886 2 2600 6859



Remark:

The test report consists of **29** pages in total. It shall not be reproduced except in full, without the written approval of IETC. This document may be altered or revised by IETC only, and shall be noted in the revision section of the document.

The test result in this report is only subjected to the test sample.

Table of Contents

1	General Information	4
1.1	Description of Equipment Under Test	4
1.2	Details of tested peripheral equipment	5
1.3	Test Facility	6
1.4	Test Equipment	7
1.5	Measurement Uncertainty	7
1.6	Summary of Measurement	8
2	Test Specifications	9
2.1	Test Standard	9
2.2	Operation Mode	9
2.3	Test Step of EUT	9
3	Fundamental and Spurious Emission Test	10
3.1	Limits	10
3.2	Measuring instrument setting	10
3.3	Test diagram	11
3.4	Test procedure	12
3.5	Test Result	12
4	20dB Bandwidth Test	16
4.1	Limits	16
4.2	Measuring instrument setting	16
4.3	Test Procedure	16
4.4	Test Result	17
5	AC Power Line Conducted Emission test	18
5.1	Limit	18
5.2	Configuration of Measurement	18
5.3	Test Procedures	18
5.4	Test Result	19
6	Photographs of Test	22
6.1	AC Power Line Conducted Emission test	22
6.2	Radiated Emission Measurement	23
7	Photographs of EUT	24

Statement of Compliance

Applicant: KUANHUR TECHNOLOGIES CO., LTD.

Manufacturer: KUANHUR TECHNOLOGIES CO., LTD.

Product: Diagnostic Tool

Model No.: DT-083001

Tested Power Supply: DC 3.7V

Date of Final Test: Dec. 21, 2017

Revision of Report: Rev. 02

Configuration of Measurements and Standards Used :

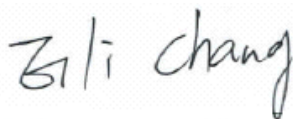
FCC Rules and Regulations Part 15 Subpart C

I HEREBY CERTIFY THAT: The data shown in this report were made in accordance with the procedures given in ANSI C63.10, 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: 2018/01/18

Project Engineer: 
Elli Chang

Approved: 
Jerry Liu

1 General Information

1.1 Description of Equipment Under Test

Product	: Diagnostic Tool
Model Number	: DT-083001
Applicant	: KUANHAUR TECHNOLOGIES CO., LTD. 6F.-2, NO.305, SEC. 3, ZHONGXIAO E. RD., DA-AN DIST., TAIPEI CITY 10654, Taiwan
Manufacturer	: KUANHAUR TECHNOLOGIES CO., LTD. 6F.-2, NO.305, SEC. 3, ZHONGXIAO E. RD., DA-AN DIST., TAIPEI CITY 10654, Taiwan
Power Supply	: DC 3.7V <u>Micro USB Cable</u> : Shielded, Detachable, 1.0 m, without core
Operating Frequency	: 125 kHz
Channel Number	: 1 channel
Type of Modulation	: Non-modulation
Antenna Description	: This device uses PCB Printed. Antenna gain: 0 dBi. The antenna is integral to the device, thereby meeting the requirement of FCC 15.203.
Measurement Software	: e3; Ver: 8.120803a7-2
Date of Test	: Dec. 17 ~ 21, 2017
Additional Description	: 1) The test model is “ DT-083001 ” and included in this report. 2) For more detail specification about EUT, please refer to the user's manual.

1.2 Details of tested peripheral equipment

1.2.1 PC

PC57

Model Number : OptiPlex 9020
CPU Speed : Dual Core Intel Core i5 4590 3.30GHz
Serial Number : 32V6052
EMC Compliance : CE, FCC, VCCI, BSMI 33002
Manufacturer : DELL
Switching Power Supply : L290EM-00
Power Cord : Non-shielded, Detachable, 1.8m, w/o core

1.2.2 Monitor

MT39

Model Number : VS228/VS228H
Serial Number : B3LMTF185625
EMC Compliance : FCC, CE, VCCI, BSMI R31018
Manufacturer : ASUS
Power Cord : Non-shielded, Un-detachable, 1.8m, w/o core
Data Cable : D-Sub Cable: Shielded 1.8m, with core

1.2.3 Keyboard

KB40 (USB)

Model Number : Y-U0011
Serial Number : N/A
EMC Compliance : CE, FCC, C-Tick, BSMI T51160, VCCI
Manufacturer : LOGITECH
Data Cable : Non-Shielded, Un-detachable, 1.5m

1.2.4 Mouse

USB73

Model Number : MS11-T
Serial Number : CN-0KW2YH-71616-322-1KPC-A02
EMC Compliance : FCC, CE, ICC, BSMI R3A002, VCCI
Manufacturer : DELL
Data Cable : Non-shielded, Un-detachable, 1.8m

1.2.5 Test Cable

Console Cable : Non-shielded, Detachable, 1.0m, w/o core

1.3 Test Facility

- Site Description** : ☑RF Test Room ☑Chamber 3
- Name of Firm** : Interocean EMC Technology Corp.
- Company web** : <http://www.ietc.com.tw>
- Location** : No. 5-2, Lin 1, Tin-Fu, Lin-Kou Dist., New Taipei City, Taiwan 244, R.O.C.
- Site Filing** : ● Federal Communication Commissions – USA
Designation No.: TW1020 (Test Firm Registration #: 651092)
Designation No.: TW1113 (Test Firm Registration #: 959554)
● Industry Canada (IC)
OUR FILE: 46405-4437
Registration No. (OATS 1): Site# 4437A-1
Registration No. (OATS 3): Site# 4437A-3
Registration No. (Chamber 3): Site# 4437A-5
Registration No. (OATS 5): Site# 4437A-6
● 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-10274
- Site Accreditation** : ● Bureau of Standards and Metrology and Inspection (BSMI) – Taiwan, R.O.C.
Accreditation No.:
SL2-IN-E-0026 for CNS 13438 / CISPR 22
SL2-R1-E-0026 for CNS 13439 / CISPR 13
SL2-R2-E-0026 for CNS 13439 / CISPR 13
SL2-L1-E-0026 for CNS 14115 / CISPR 15
● Taiwan Accreditation Foundation (TAF)
Accreditation No.: 1113
● Vehicle Safety Certification Center (VSCC)
Approval No.: TW16-11
● TÜV NORD
Certificate No: TNTW0801R

1.4 Test Equipment

Instrument	Manufacturer	Model	Serial No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	ESI7	830154/002	2018/10/17
Spectrum Analyzer	Rohde & Schwarz	FSP40	100478	2018/06/19
Loop Antenna	Electro-Metrics	EM-6879	261	2018/08/07
Bilog Antenna	Schwarzbeck	MCTD 2786B	BLB17S04020	2018/10/04
Pre-Amplifier	Burgeon	BPA-530	100216	2018/09/25
RF Cable	Jye Bao	A30N30-5005	CBL51	2018/07/31
RF Cable	Jye Bao	N30N30-5006	CBL53	2018/07/31
RF Cable	HARBOUR	27478LL142	CBL65	2018/07/31
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100134	2018/08/09
L.I.S.N.	Schwarzbeck	NNLK8121	8121417	2018/03/24
L.I.S.N.	Schaffner	MN2050D	1598	2018/08/22
RF Cable	IETC	CBL68	CBL68	2018/07/31
Measurement Software	AUDIX-e3			

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

1.5 Measurement Uncertainty

Item	Expended Uncertainty (k=2)
Conduction 1:	
Conducted Emission (9 kHz to 30 MHz)	2.98 dB
Chamber 3:	
Radiated Emission Test (9 kHz to 30 MHz)	3.12 dB
Radiated Emission Test (30 MHz to 1 GHz)	4.86 dB
Radiated Emission Test (above 1 GHz)	5.12 dB
RF test:	
RF conducted measurement (9 kHz to 40GHz)	2.92 dB

1.6 Summary of Measurement

Report Clause	Test Parameter	Reference Document 47 CFR Part15	Results
3	Fundamental and Spurious Emission	15.209	Pass
4	20 dB Bandwidth	15.215	Pass
5	AC Power Line Conducted Emission	15.207	Pass

2 Test Specifications

2.1 Test Standard

The EUT was performed according to FCC Part 15 Subpart C procedure and setup followed by ANSI C63.10, 2013 requirements.

2.2 Operation Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “Z axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

The EUT was operated in continuous transmission mode during all of the tests.



X axis mode



Y axis mode



Z axis mode

2.3 Test Step of EUT

- 2.3.1 Setup the fixture to EUT for power supplying.
- 2.3.2 Turn on the power of all equipment.
- 2.3.3 Let the EUT continuous transmission. Executed the test.

3 Fundamental and Spurious Emission Test

3.1 Limits

According to 15.209(a) requirement, except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	2400/F(kHz)	30
1.705~30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remark:

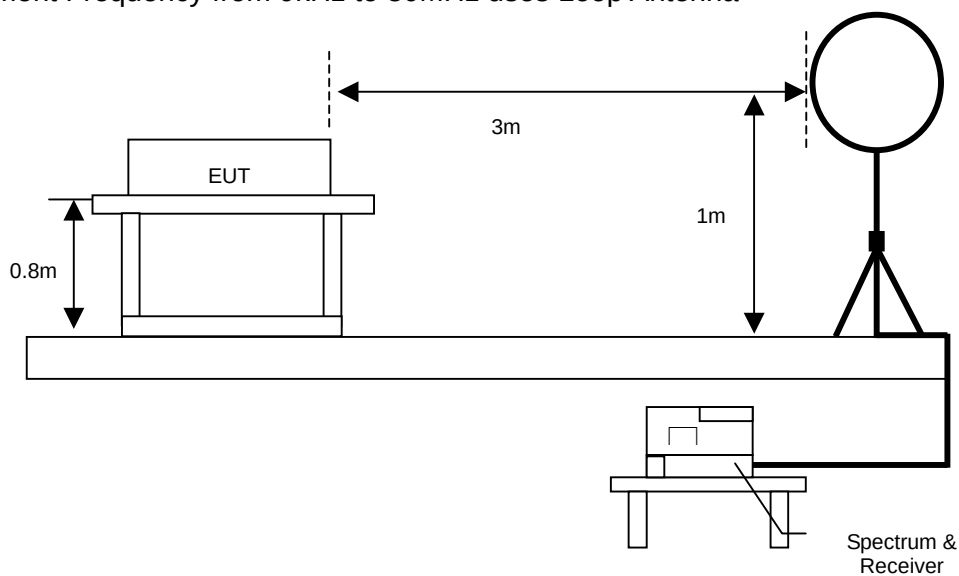
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

3.2 Measuring instrument setting

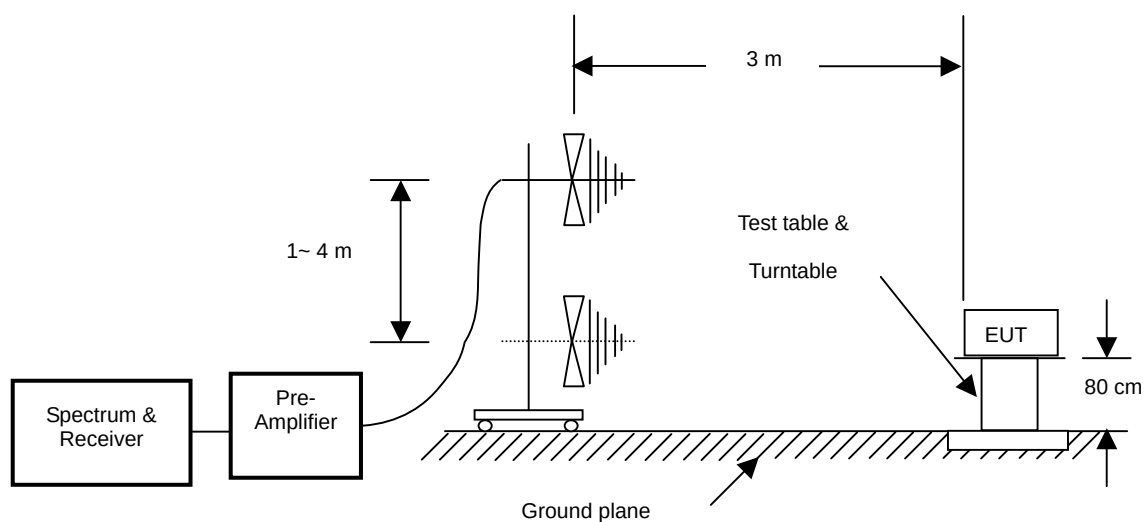
Receiver settings	
Receiver function	Setting
Detector	QP
RBW	9-150 kHz ; 200-300 Hz 0.15-30 MHz; 9-10 kHz 30-1000 MHz; 100-120 kHz
VBW	$\geq 3 \times \text{RBW}$
Sweep	Auto couple
Attenuation	Auto

3.3 Test diagram

Measurement Frequency from 9kHz to 30MHz uses Loop Antenna



Measurement Frequency below 1GHz



3.4 Test procedure

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the companion devices. The turntable was rotated by 360 degree to find the position of the maximum emission level.
3. The height of the receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of the both horizontal and vertical polarization
4. If find the frequencies above the limit or below within 3dB, the antenna tower was scan (from 1m to 4m) and then the turntable was rotated to find the maximum reading.
5. Set the test-receiver system to peak or CISPR quasi-peak detector with specified bandwidth under maximum hold mode.
6. If the emissions level of the EUT in peak mode was 3dB lower than the average limit specified then testing will be stopped and peak values of the EUT will be reported. Otherwise, the emissions which do not have 3dB margin will be measured using the quasi-peak method for below 1GHz.
7. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be quasi-peak measured by receiver.

3.5 Test Result

PASS.

The final test emission data is shown as following tables.

Fundamental and Spurious Radiated Emissions

Test Environment

Ambient temperature : 24.5°C

Relative humidity : 46%

Fundamental: 125kHz

Frequency	Antenna	Reading	Preamp	Correction Factor	Corrected Level	Limits	Margin	Detector
(kHz)	Polarization	(dBuV)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
125.0 (EUT X Axis)	parallel	65.02	30.98	56.49	90.53	105.66	-15.13	PK
125.0 (EUT Y Axis)	parallel	59.65	30.98	56.49	85.16	105.66	-20.50	PK
125.0 (EUT Z Axis)	parallel	68.88	30.98	56.49	94.39	105.66	-11.27	PK
125.0 (EUT Z Axis)	perpendicular	63.41	30.98	56.49	88.92	105.66	-16.74	PK
125.0 (EUT Z Axis)	ground-parallel	55.65	30.98	56.49	81.16	105.66	-24.50	PK

Remark : Fundamental Peak Limit: 125.66 (dBuV/m)

Fundamental AV Limit: 105.66 (dBuV/m)

If the peak amplitude can be shown to comply with the AV limit, then it is not necessary to perform a separate AV measurement

Limit@3m (dBuV/m) = 20 Log [2,400/f(kHz)] + 80dB (40 Log@300/3)

Radiated emission: Frequency 9k to 30MHz (Worse case: Antenna polarization is parallel)

Frequency	Antenna	Reading	Preamp	Correction Factor	Corrected Level	Limits	Margin	Detector
(MHz)	Polarization	(dBuV)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
0.330	parallel	49.07	30.83	48.49	66.73	97.22	-30.49	PK
0.582	parallel	39.07	30.79	44.66	52.94	72.31	-19.37	PK
0.866	parallel	35.06	30.82	42.50	46.74	68.86	-22.12	PK
1.106	parallel	32.88	30.86	41.30	43.32	66.75	-23.43	PK
1.345	parallel	30.11	30.92	40.51	39.70	65.05	-25.35	PK
1.829	parallel	26.75	31.02	39.26	34.99	69.50	-34.51	PK

Remark : 9k to 90kHz, 110k to 490kHz, measurement employ peak and average detector,

Other frequencies measurement employ quasi-peak (QP) detector

If the peak amplitude can be shown to comply with the QP or AV limit, then it is not necessary to perform a separate QP or AV measurement

Correction Factor = Antenna Factor + Cable Loss

Corrected Level = Reading + Correction Factor – Preamp

Margin = Corrected Level – Limits

9k to 490kHz Limit@3m (dBuV/m) = $20 \log [2,400/f(\text{kHz})] + 80\text{dB}$ (40 Log@300/3)

490k to 1.705MHz Limit@3m (dBuV/m) = $20 \log [2,4000/f(\text{kHz})] + 40\text{dB}$ (40 Log@30/3)

1.705M to 30MHz Limit@3m (dBuV/m) = $20 \log 30 + 40\text{dB}$ (40 Log@30/3)

Radiated emission: Frequency 30MHz to 1GHz

Frequency	Antenna	Reading	Preamp	Correction Factor	Corrected Level	Limits	Margin	Detector
(MHz)	Polarization	(dBuV)	(dB)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	
45.54	H	35.50	31.68	19.32	23.14	40.00	-16.86	QP
325.60	H	43.89	31.26	22.67	35.30	46.02	-10.72	QP
399.03	H	44.16	31.31	24.83	37.68	46.02	-8.34	QP
462.35	H	46.78	31.30	25.74	41.22	46.02	-4.80	QP
547.10	H	45.71	31.32	27.14	41.53	46.02	-4.49	QP
679.96	H	47.06	31.33	28.92	44.65	46.02	-1.37	QP
45.54	V	38.59	31.68	19.32	26.23	40.00	-13.77	QP
63.09	V	38.34	31.63	16.12	22.83	40.00	-17.17	QP
313.28	V	36.69	31.25	22.33	27.77	46.02	-18.25	QP
392.10	V	37.72	31.31	24.62	31.03	46.02	-14.99	QP
470.52	V	41.35	31.30	25.87	35.92	46.02	-10.10	QP
668.14	V	37.10	31.33	28.76	34.53	46.02	-11.49	QP

Remark : Correction Factor = Antenna Factor + Cable Loss

Corrected Level = Reading + Correction Factor – Preamp

Margin = Corrected Level – Limits

As an alternative to CISPR quasi-peak measurement, compliance can be determined for the applicable emission requirements using a peak detector.

4 20dB Bandwidth Test

4.1 Limits

None

4.2 Measuring instrument setting

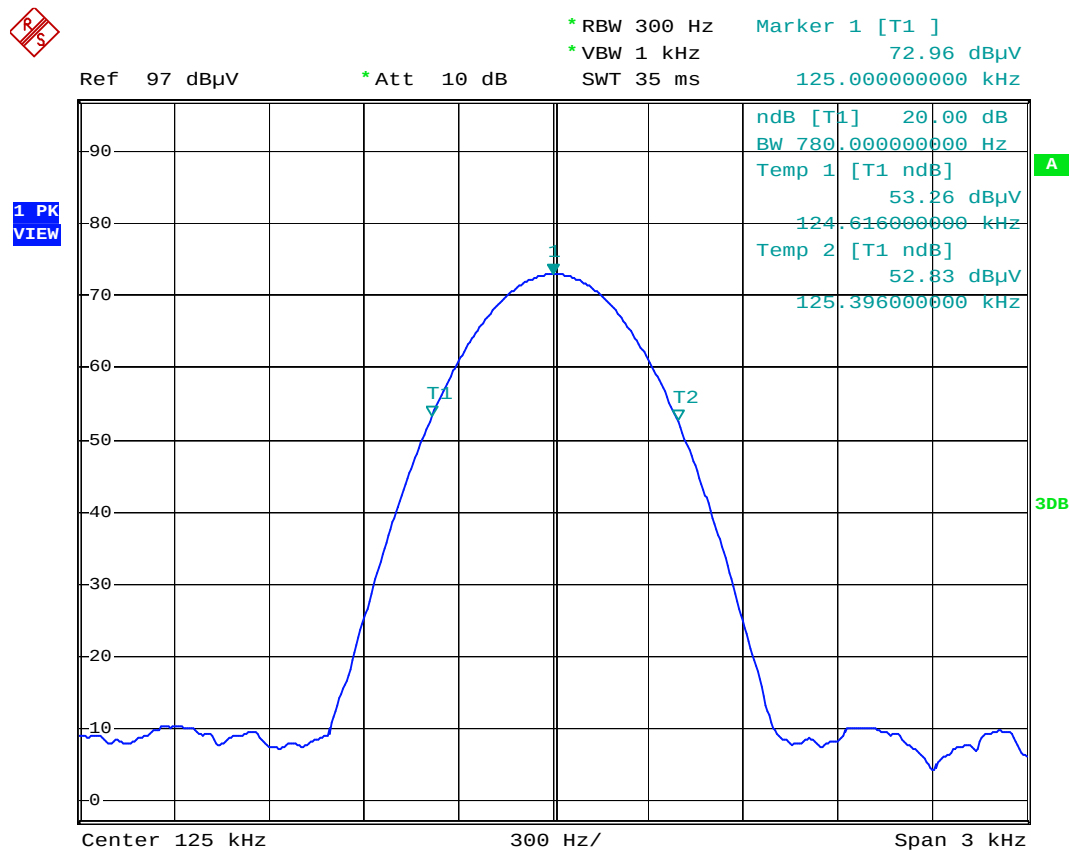
Spectrum analyzer settings	
Spectrum Analyzer function	Setting
Detector	Peak
RBW	300Hz
VBW	$\geq 3 \times \text{RBW}$
Sweep	Auto couple
Trace	Allow the trace to stabilize.
Span	≥ 1.2 times the 20 dB bandwidth
Attenuation	Auto

4.3 Test Procedure

The 20 dB bandwidth was measured by spectrum analyzer connected to a receive antenna placed near the test sample while it is transmitting.

4.4 Test Result

Bandwidth	Frequency (kHz)	Bandwidth (Hz)
20dB	125	780



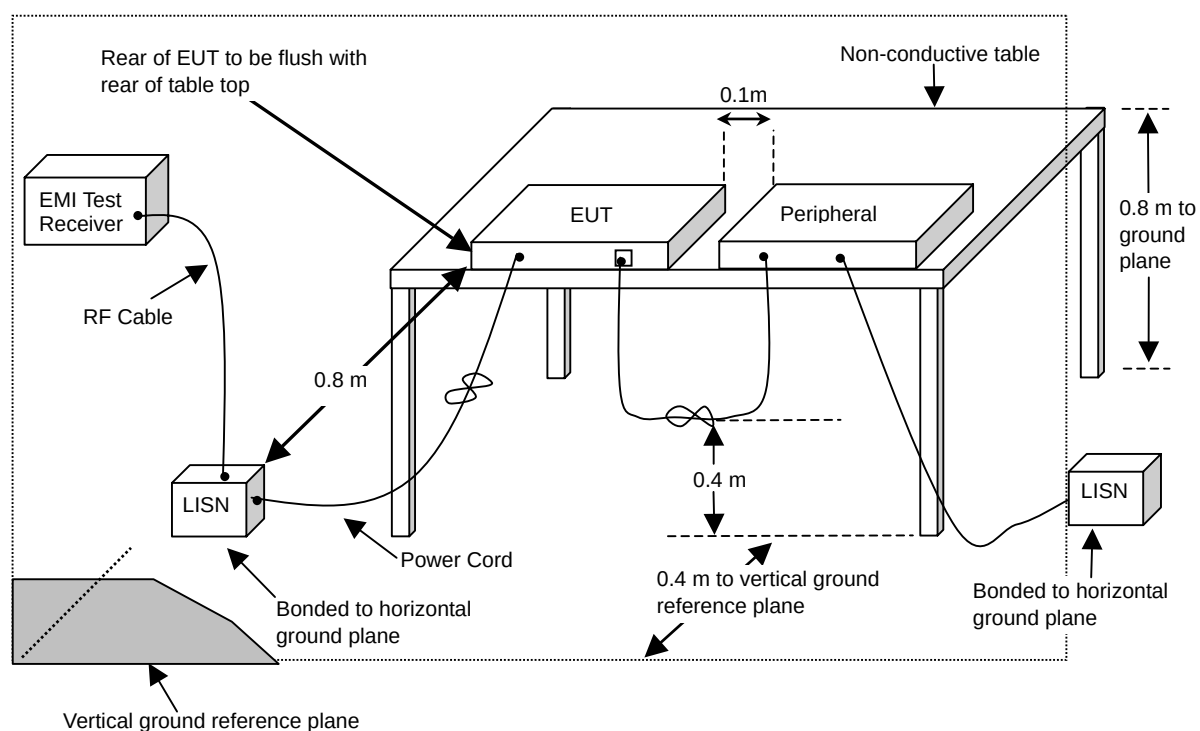
5 AC Power Line Conducted Emission test

5.1 Limit

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

The EUT was setup to ANSI C63.10, 2013 requirements.

- 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 C63.10, 2013 on conducted measurement.

5.4 Test Result

PASS.

The final test data is shown on as following pages.

Factor = Insertion Loss + Cable Loss

Level = Reading + Factor

Margin = Level - Limit

Power Line Conducted Test Data

CLIENT: KUANHAUR TECHNOLOGIES CO., LTD.

OPERATOR: Elli

EUT: Diagnostic Tool

TEST SITE: Conducted 1

MODEL: DT-083001

POLARIZATION: Line

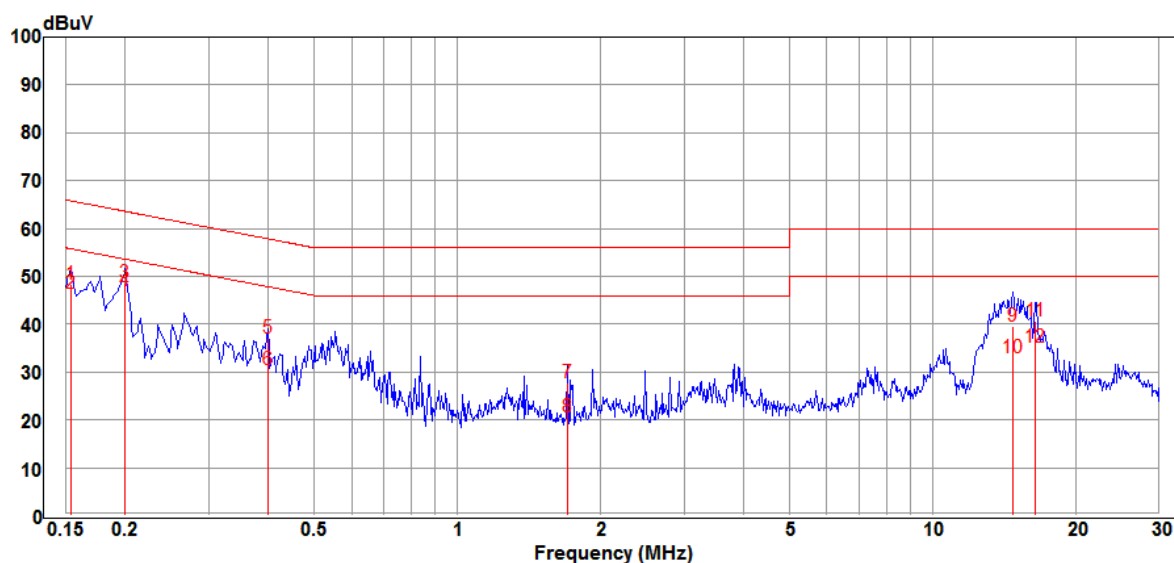
RATING: From PC (120Vac, 60Hz)

TEMP/HUM: 21.7°C / 51%

COMMENT: Working Mode

Data:5

2017-12-20



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.1540	38.30	10.18	48.48	65.78	-17.30	QP
2	0.1540	36.38	10.18	46.56	55.78	-9.22	Average
3	0.2008	38.53	10.19	48.72	63.58	-14.86	QP
4	0.2008	36.90	10.19	47.09	53.58	-6.49	Average
5	0.3997	26.94	10.22	37.16	57.86	-20.70	QP
6	0.3997	20.17	10.22	30.39	47.86	-17.47	Average
7	1.7070	17.46	10.33	27.79	56.00	-28.21	QP
8	1.7070	10.20	10.33	20.53	46.00	-25.47	Average
9	14.7500	29.26	10.35	39.61	60.00	-20.39	QP
10	14.7500	22.74	10.35	33.09	50.00	-16.91	Average
11	16.4860	30.30	10.39	40.69	60.00	-19.31	QP
12	16.4860	24.92	10.39	35.31	50.00	-14.69	Average

Power Line Conducted Test Data

CLIENT: KUANHAUR TECHNOLOGIES CO., LTD.

OPERATOR: Elli

EUT: Diagnostic Tool

TEST SITE: Conducted 1

MODEL: DT-083001

POLARIZATION: Neutral

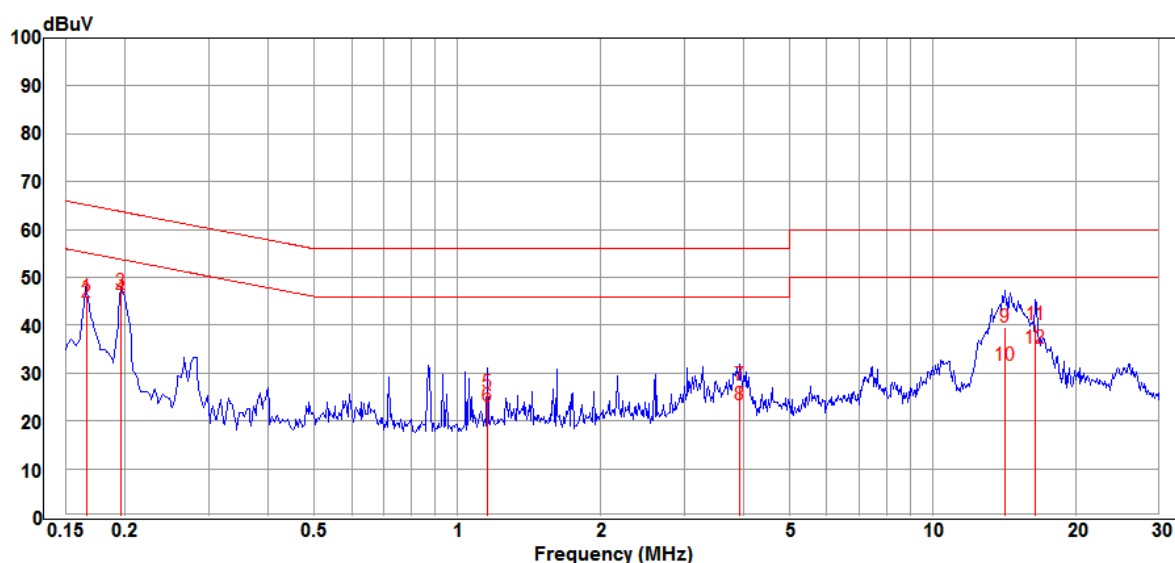
RATING: From PC (120Vac, 60Hz)

TEMP/HUM: 21.7°C / 51%

COMMENT: Working Mode

Data:3

2017-12-20



Item Mark	Freq. MHz	Reading dBuV	Factor dB	Level dBuV	Limit dBuV	Margin dB	Remark
1	0.1659	35.64	10.18	45.82	65.16	-19.34	QP
2	0.1659	34.70	10.18	44.88	55.16	-10.28	Average
3	0.1965	36.69	10.19	46.88	63.76	-16.88	QP
4	0.1965	35.38	10.19	45.57	53.76	-8.19	Average
5	1.1600	15.46	10.27	25.73	56.00	-30.27	QP
6	1.1600	12.71	10.27	22.98	46.00	-23.02	Average
7	3.9220	16.95	10.42	27.37	56.00	-28.63	QP
8	3.9220	12.85	10.42	23.27	46.00	-22.73	Average
9	14.2130	29.27	10.36	39.63	60.00	-20.37	QP
10	14.2130	21.24	10.36	31.60	50.00	-18.40	Average
11	16.4860	29.76	10.39	40.15	60.00	-19.85	QP
12	16.4860	24.67	10.39	35.06	50.00	-14.94	Average