FCC 47 CFR PART 15 SUBPART B TEST REPORT

for

DC-DC Converter

MODEL: PU-3 SERIES

BRAND: DANUBE

Test Report Number:
T120308N03-D

Issued to:

Danube Enterprise Co., Ltd.

A2, No.255 Fengren Rd., Renwu Dist, Kaohsiung City 81452, Taiwan (R.O.C)

Issued by:

Compliance Certification Services Inc.
Tainan BU.
No.8,Jiucengling, Xinhua Dist., Tainan City
712, Taiwan (R.O.C.)
TEL: 886-6-5802201
FAX: 886-6-5802202

Issued Date: March 30, 2012

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	March 30, 2012	Initial Issue	ALL	Eva Lin

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1 TEST RESULT CERTIFICATION

Product:	DC-DC Converter
Model:	PU-3 SERIES
Brand:	DANUBE
Applicant:	Danube Enterprise Co., Ltd. A2, No.255 Fengren Rd., Renwu Dist, Kaohsiung City 81452, Taiwan (R.O.C)
Manufacturer	Danube Enterprise Co., Ltd. A2, No.255 Fengren Rd., Renwu Dist, Kaohsiung City 81452, Taiwan (R.O.C)
Tested:	March 19, 2012 – March 21, 2012

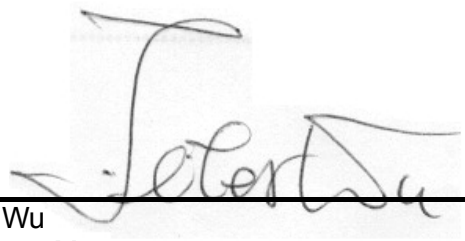
EMISSION			
Standard	**Item**	**Result**	**Remarks**
FCC 47 CFR Part 15 Subpart B, ICES-003 Issue 4 ANSI C63.4-2003	Conducted (Power Port)	PASS	No Requirement for DC device
	Radiated (Below 1GHz)	PASS	Meet Class B limit
	Radiated (Above 1GHz)	N/A	No Requirement

Note: 1. The statements of test result on the above are decided by the request of test standard only; the measurement uncertainties are not factored into this compliance determination.
2. The information of measurement uncertainty is available upon the customer's request.

Deviation from Applicable Standard
None

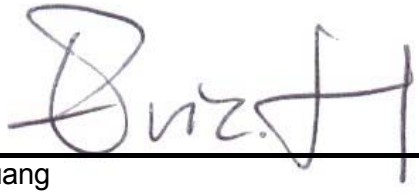
The above equipment has been tested by Compliance Certification Services Inc., and found compliance with the requirements set forth in the technical standards mentioned above. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Approved by:



Jeter Wu
Assistant Manager

Reviewed by:



Eric Huang
Assistant Section Manager

2 EUT DESCRIPTION

Product	DC-DC Converter
Model	PU-3 SERIES
Brand Name	DANUBE
Applicant	Danube Enterprise Co., Ltd.
Manufacture	Danube Enterprise Co., Ltd.
Housing material	Plastics
Identify Number	T120308N03
Received Date	March 08, 2012
EUT Power Rating	For model: PUS-0505B3 (I/P:5Vdc, O/P:5Vdc/600mA) For model: PUS-2415B3 (I/P:24Vdc, O/P:15Vdc/200mA)

Note:
Client consigns only two model samples to test (Model Number: PUS-0505B3; PUS-2415B3). Therefore, the testing Lab. just guarantees the unit, which has been tested.

PARTNUMBERS STRUCTURE

Model Name	Difference
PUv-x1x2x3x4 **PUv-x1x2x3x4x5-zzz**	**P=Series Name** **U=Unregulated** **v=Type of output voltage (S=Single output；D=Dual output)** **x1=Input voltage** **(03.3~4.5V；05~8.5V；09~11.5V；12~14.5V；15~18V；19~24V)** **x2=Output voltage** **(03.3~4.5V；05~8.5V；09~11.5V；12~14.5V；15~18V；19~24V)** **x3=Difference Package** **X4=Type of output power** **X5=Function** **zzz= 0~9，A~Z or blank for market purpose**

3 TEST METHODOLOGY

3.1. DECISION OF FINAL TEST MODE

The EUT was tested together with the above additional components, and a configuration, which produced the worst emission levels, was selected and recorded in this report.

The test configuration/ modes are as the following:

Conduction Modes:

1.	**N/A**

Radiation Modes: Full Load

1.	**PUS-0505B3**
2.	**PUS-2415B3**

3.2. EUT SYSTEM OPERATION

1. Setup whole system for test as shown on setup diagram.
2. Turn on power and check function.
3. Start to test by test mode.

4 SETUP OF EQUIPMENT UNDER TEST

4.1. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

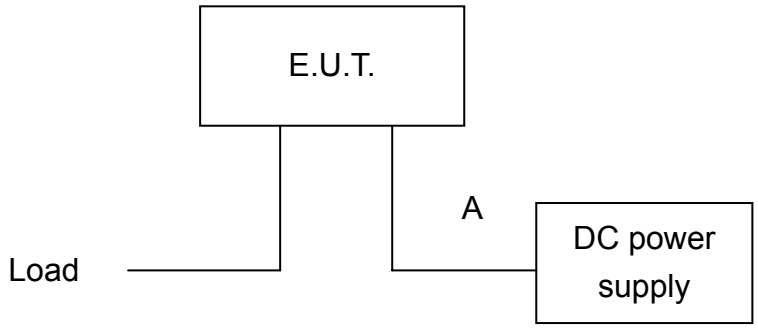
Peripherals Devices:

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	DC power supply	LOKO	DPS-5050	DOC	Power cable, unshd, 1.6m

No.	Signal cable description	
A	DC Power	Unshielded, 0.4m, 1pcs

Note:
1) All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2) Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.2. CONFIGURATION OF SYSTEM UNDER TEST



5 FACILITIES AND ACCREDITATIONS

5.1. FACILITIES

All measurement facilities used to collect the measurement data are located at CCS Taiwan Tainan BU. at
No.8,Jiucengling, Xinhua Dist., Tainan City 712, Taiwan (R.O.C.)

The sites are constructed in conformance with the requirements of ANSI C63.4 and CISPR Publication 22. All receiving equipment conforms to CISPR 16-1-1, CISPR 16-1-2, CISPR 16-1-3, CISPR 16-1-4 and CISPR 16-1-5.

5.2. ACCREDITATIONS

Our laboratories are accredited and approved by the following accreditation body according to ISO/IEC 17025.

Taiwan	TAF

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada
Germany	TUV NORD
Taiwan	BSMI
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, http://www.ccsrf.com

5.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement		Frequency	Uncertainty
Power Line Conducted Emission		9kHz~30MHz	±2.90dB
Radiated Emission (10m)	Test Site : OATS-5	30 MHz ~200 MHz	±3.76dB
		200 MHz ~1000 MHz	±3.73dB
	Test Site : OATS-6	30 MHz ~200 MHz	±3.60dB
		200 MHz ~1000 MHz	±3.70dB
	Test Site : OATS-7	30 MHz ~200 MHz	±3.99dB
		200 MHz ~1000 MHz	±3.31dB
Radiated Emission (3m)	Test Site : OATS-5	30 MHz ~200 MHz	±3.38dB
		200 MHz ~1000 MHz	±3.27dB
	Test Site : OATS-6	30 MHz ~200 MHz	±3.59dB
		200 MHz ~1000 MHz	±3.27dB
	Test Site : OATS-6	1000 MHz ~6000 MHz	±3.20dB

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

Consistent with industry standard (e.g. CISPR 22: 2005, clause 11, Measurement Uncertainty) determining compliance with the limits shall be base on the results of the compliance measurement. Consequently the measure emissions being less than the maximum allowed emission result in this be a compliant test or passing test.

The acceptable measurement uncertainty value without requiring revision of the compliance statement is base on conducted and radiated emissions being less than U_{CISPR} which is 3.6dB and 5.2dB respectively. CCS values (called U_{Lab} in CISPR 16-4-2) is less than U_{CISPR} as shown in the table above. Therefore, MU need not be considered for compliance.

6 CONDUCTED EMISSION MEASUREMENT

6.1. LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Class A (dBuV)		Class B (dBuV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.50 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range 0.15 to 0.50 MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

6.2. TEST INSTRUMENTS

Conducted Emission room # 1				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
L.I.S.N.	SCHWARZBECK	NNLK 8130	8130124	Sep. 25, 2012
	Rohde & Schwarz	ESH 3-Z5	840062/021	Aug. 02, 2012
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUL. 03, 2012
BNC COAXIAL CABLE	CCS	BNC50	11	OCT. 30, 2012
Test S/W	e-3 (5.04211c) R&S (2.27)			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

6.3. TEST PROCEDURES

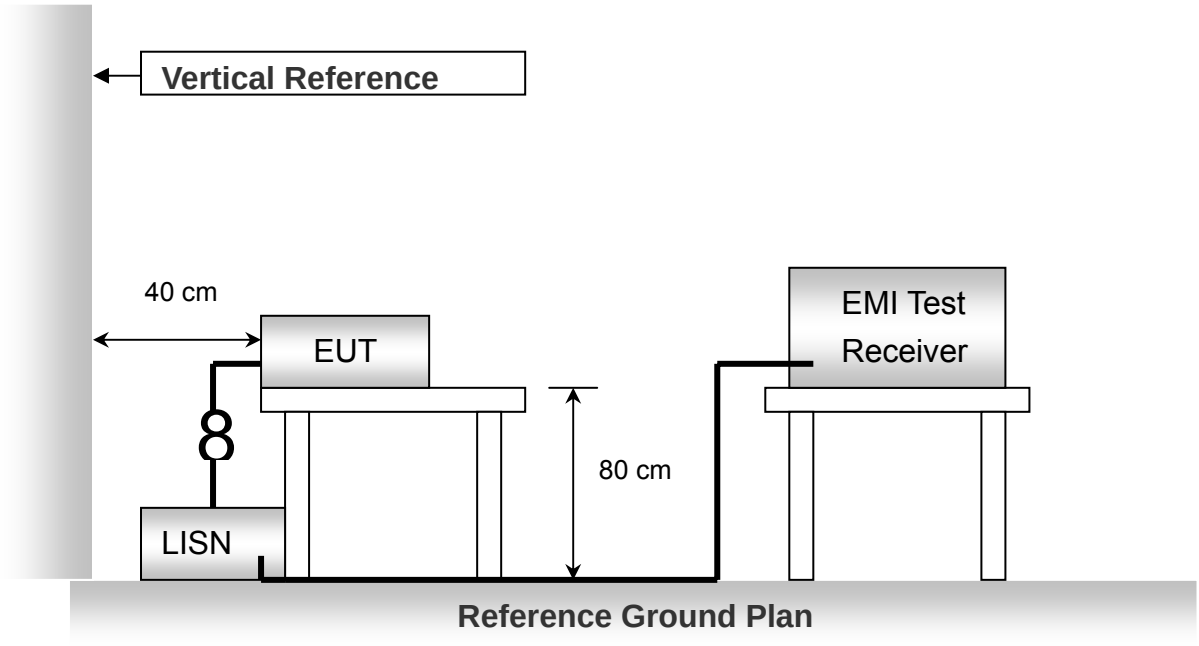
Procedure of Preliminary Test

- The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 12 mm non-conductive covering to insulate the EUT from the ground plane.
- All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.
- The test equipment EUT installed by DC main power, through a Line Impedance Stabilization Network (LISN), which was supplied power source and was grounded to the ground plane.
- All support equipment power by from a second LISN.
- The test program of the EUT was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.
- The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.
- During the above scans, the emissions were maximized by cable manipulation.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test.
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.
- A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.
- The test data of the worst-case condition(s) was recorded.

6.4. TEST SETUP



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

6.5. DATA SAMPLE

Freq. (MHz)	LISN Factor (dB)	Cable Loss (dB)	Meter Reading (dBuV)	Measured Level (dBuV)	Limits (dBuV)	Over Limits (dBuV)	Detector
x.xx	9.6	0.1	15.7	25.4	46	-20.6	QP

Freq. = Emission frequency in MHz
LISN Factor = Insertion loss of LISN and Pulse Limiter
Cable Loss = Cable's loss (LISN to EMI Tester Receiver)
Meter Reading = Uncorrected Analyzer/Receiver reading
Measured Level = Meter Reading + LISN Factor + Cable loss
Limit = Limit stated in standard
Over Limit = Measured Level - Limits
Detector : Peak/PK = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

Calculation Formula

1. Measured Level (dBuV) = LISN Factor (dB) + Cable Loss (dB)+ Meter Reading (dBuV)
2. Over Limit (dBuV) = Measured Level (dBuV) – Limits (dBuV)

6.6. TEST RESULTS

※ This EUT do not connect to AC Source directly. Not applicability for this test.

7 RADIATED EMISSION MEASUREMENT

7.1. LIMITS OF RADIATED EMISSION MEASUREMENT

Below 1GHz (for digital device)

FREQUENCY (MHz)	dBuV/m (At 10m)	
	Class A	Class B
30 ~ 230	40	30
230 ~ 1000	47	37

Limit tables for non-digital device:

Class A Radiated Emission limit at 10m (for others)

Frequency (MHZ)	Field Strength Limit (uV/m)Q.P.	Field Strength Limit (dBuV/m)Q.P.
30 - 88	90	39
88 - 216	150	43.5
216 – 960	210	46.4
Above 960	300	49.5

Class B Radiated Emission limit at 3m (for others)

Frequency (MHZ)	Field Strength Limit (uV/m)Q.P.	Field Strength Limit (dBuV/m)Q.P.
30 - 88	100	40
88 - 216	150	43.5
216 – 960	200	46
Above 960	500	54

Above 1GHz(for all device)

Frequency (MHZ)	Class A (dBuV/m) (At 10m)		Class B (dBuV/m) (At 3m)	
	Average	Peak	Average	Peak
Above 1000	49.5	69.5	54	74

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. The measurement above 1GHz is at close-in distances 3m,and determine the limit L_2 corresponding to the close-in distance d_2 by applying the following relation: $L_2 = L_1 (d_1/d_2)$, where L_1 is the specified limit in microvolts per metre (**uV/m**) at the distance d_1 (**10m**), L_2 is the new limit for distance d_2 (**3m**).
So the new Class A limit above 1GHz at 3m is as following table:

Frequency (MHZ)	Class A (dBuV/m) (At 3m)	
	Average	Peak
Above 1000	60	80

According to FCC Part 15.33 (b), for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.75	30
1.75-108	1000
108-500	2000
500-1000	5000
Above 1000	5^{th} harmonic of the highest frequency or 40GHz, whichever is lower

7.2. TEST INSTRUMENTS

Open Area Test Site # 7				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100343	DEC. 06, 2012
TYPE N COAXIAL CABLE	SUHNER	RG_214_U/2X	7	NOV. 24, 2012
BILOG ANTENNA	Sunol sciences	JB1	A070506-1	OCT. 05, 2012
Test Software	EMI e-3 / AUDIX (5.04211c)			
Above 1GHz Used				
RF Cable	SUHNER	SUCOFLEX104PEA	20520/4PEA	NOV. 10, 2012
Horn Antenna	Com-Power	AH-118	071032	DEC. 27, 2012
Spectrum Analyzer	R&S	FSEK 30	835253/002	Sep,29,2012
Pre-Amplifier	MITEQ	AFS44-00108650-42-10P-44	1205908	NOV. 23, 2012
Turn Table	Yo Chen	001	----------	N.C.R.
Antenna Tower	AR	TP1000A	309874	N.C.R.
Controller	CT	SC101	----------	N.C.R.
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180A	EC1204141	N.C.R
Test Software	e-3 (5.04303e)			

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. N.C.R = No Calibration Request.

7.3. TEST PROCEDURES

Procedure of Preliminary Test

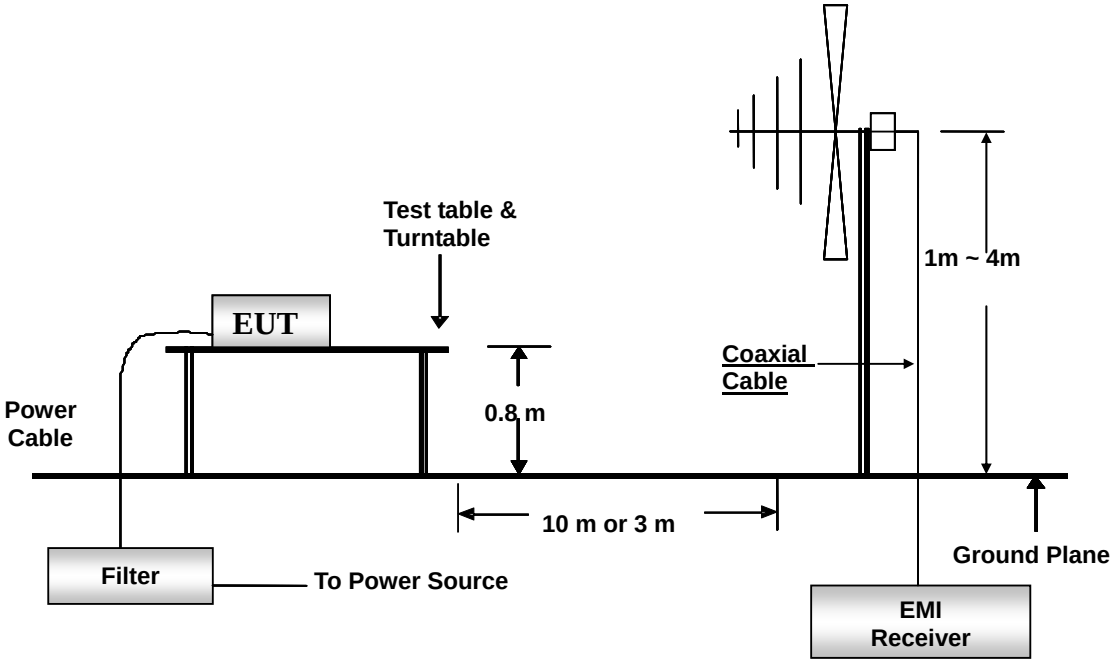
- The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 12 mm non-conductive covering to insulate the EUT from the ground plane.
- Support equipment, if needed, was placed as per ANSI C63.4.
- All I/O cables were positioned to simulate typical usage as per ANSI C63.4.
- The EUT received DC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.
- The antenna was placed at 3 or 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.
- The Analyzer / Receiver quickly scanned from 30MHz to 40GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- The test mode(s) described in Item 3.1 were scanned during the preliminary test:
- After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.
- The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.

Procedure of Final Test

- EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.
- The Analyzer / Receiver scanned from 30MHz to 40GHz. Emissions were scanned and measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.
- Recording at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. Below 1GHz the Q.P. reading and above 1GHz the Peak and Average reading are presented.
- The test data of the worst-case condition(s) was recorded.

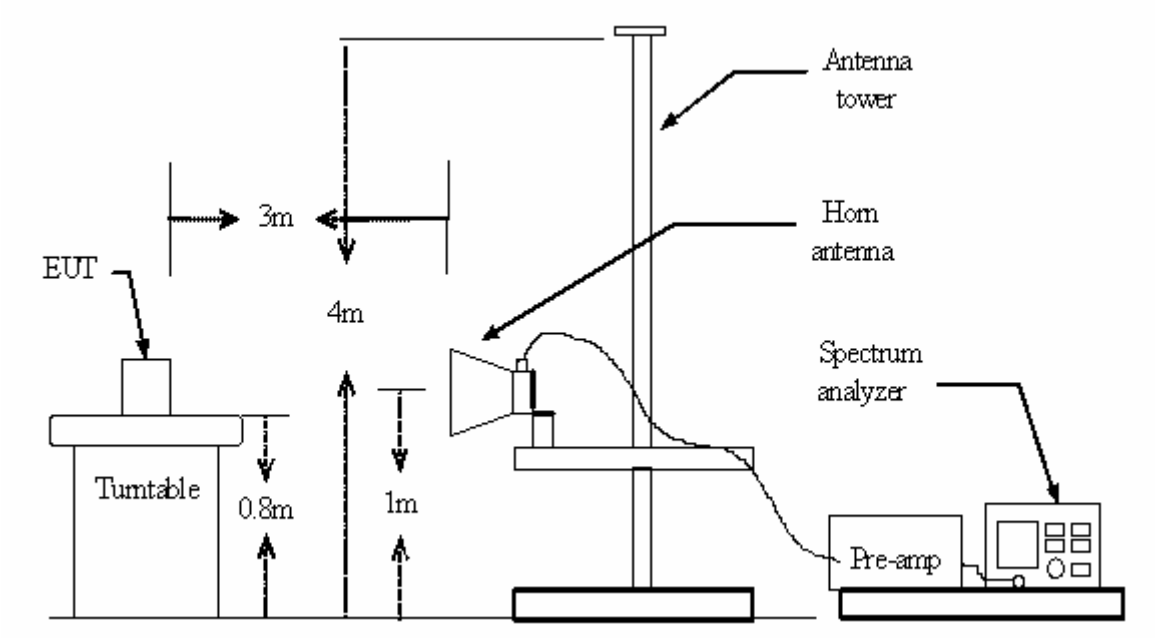
7.4. TEST SETUP

Below 1GHz



- For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

Above 1GHz



7.5. DATA SAMPLE

Below 1GHz

Freq. (MHz)	Reading dBuV/m	Antenna Factor dB	Cable loss dB	Measure level dBuV/m	Limit dBuV/m	Over limit dBuV/m	Detector
x.xx	24.48	7.33	1.50	33.31	40	-6.69	QP

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
Antenna Factor = Antenna Factor
Cable los = Cable's loss
Measure level = Reading + Antenna Factor + Cable loss
Limit = Limit stated in standard
Over limit = Measure level – Limit
Detector: Peak/PK = Peak Reading
QP = Quasi-peak Reading
AV = Average Reading

Calculation Formula

Over limit (dBuV/m) = Result (dBuV/m) – Limit (dBuV/m)

Above 1GHz

Freq.	Reading	AF	C_loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dBμV)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
XXXX. XX	56.00	25.14	2.07	41.77	0.72	42.16	70.00	-27.84	P

Freq. = Emission frequency in MHz
Reading = Uncorrected Analyzer/Receiver reading
AF = Antenna Factor
C_loss =Insertion loss of cable
Pre-amp = Pre-amplifier Gain
Filter = Insertion loss of filter
Level = Readind+AF+Closs-Pre-amp+Fliter
Limit = Limit stated in standard
Margin = Reading in reference to limit
Mark: P = Peak Reading
Q= Quasi-peak Reading
A = Average Reading
Height = Antenna Height

Calculation Formula

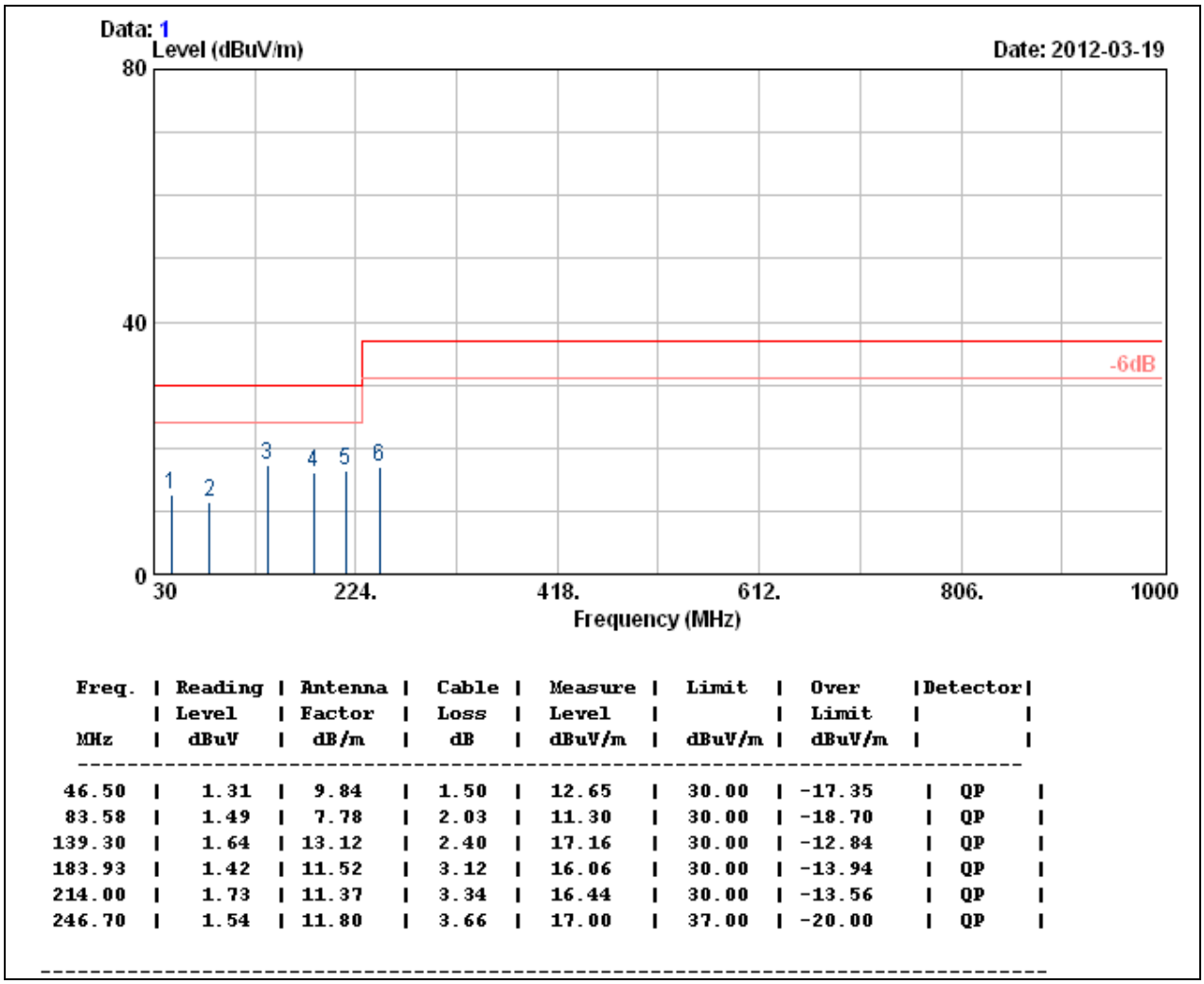
Margin (dB) =Level (dBuV/m) – Limit (dBuV/m)

7.6. TEST RESULTS

Below 1GHz

Model No.	PUS-0505B3	Test Mode	Full Load
Environmental Conditions	25deg.C, 58% RH	6dB Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Shiang Su

(The chart below shows the highest readings taken from the final data.)



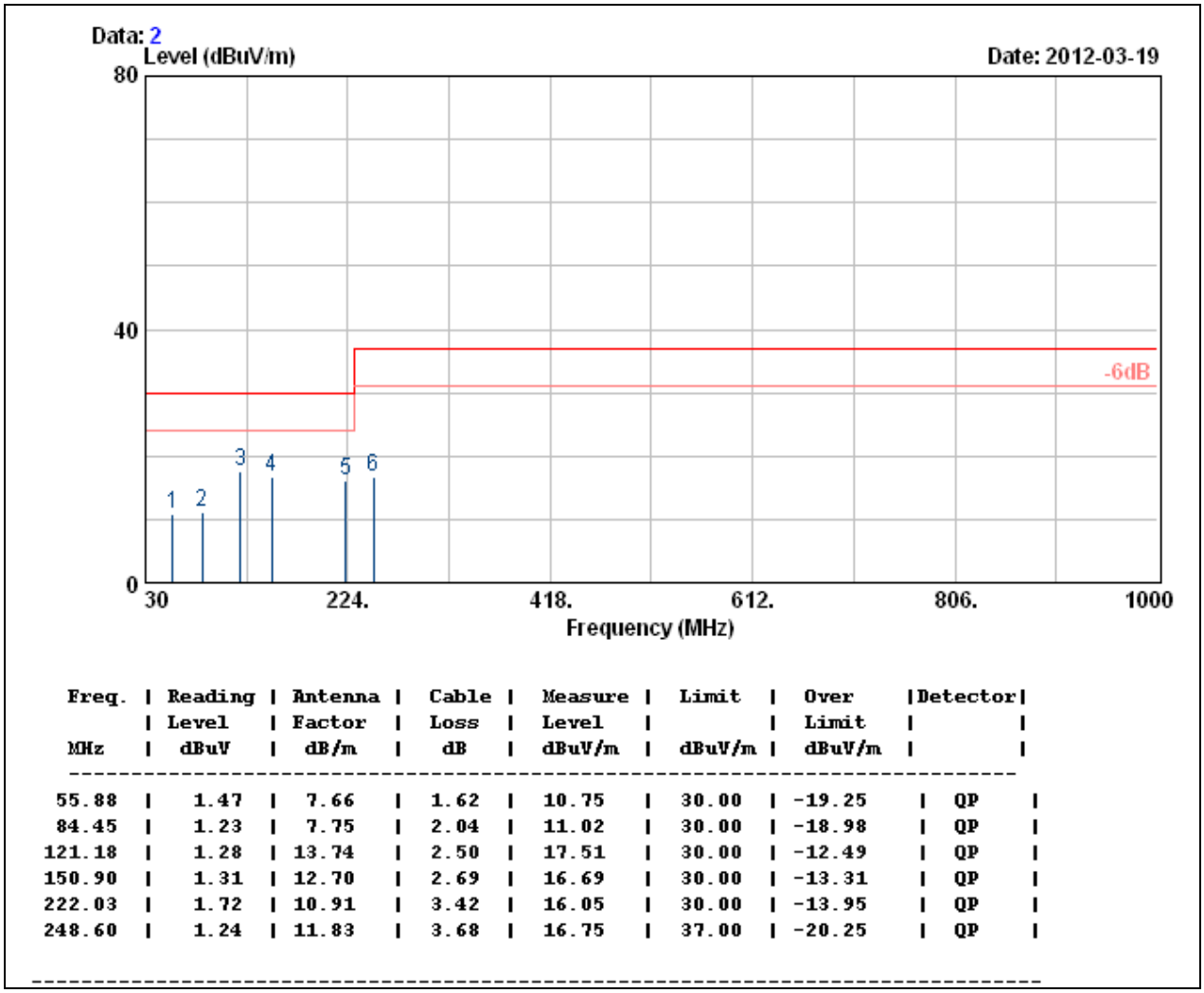
Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
46.50	1.31	9.84	1.50	12.65	30.00	-17.35	QP
83.58	1.49	7.78	2.03	11.30	30.00	-18.70	QP
139.30	1.64	13.12	2.40	17.16	30.00	-12.84	QP
183.93	1.42	11.52	3.12	16.06	30.00	-13.94	QP
214.00	1.73	11.37	3.34	16.44	30.00	-13.56	QP
246.70	1.54	11.80	3.66	17.00	37.00	-20.00	QP

Note:

1. QP= Quasi-peak Reading.
2. The other emission levels were very low against the limit.

Model No.	PUS-0505B3	Test Mode	Full Load
Environmental Conditions	25deg.C, 58% RH	6dB Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Shiang Su

(The chart below shows the highest readings taken from the final data.)



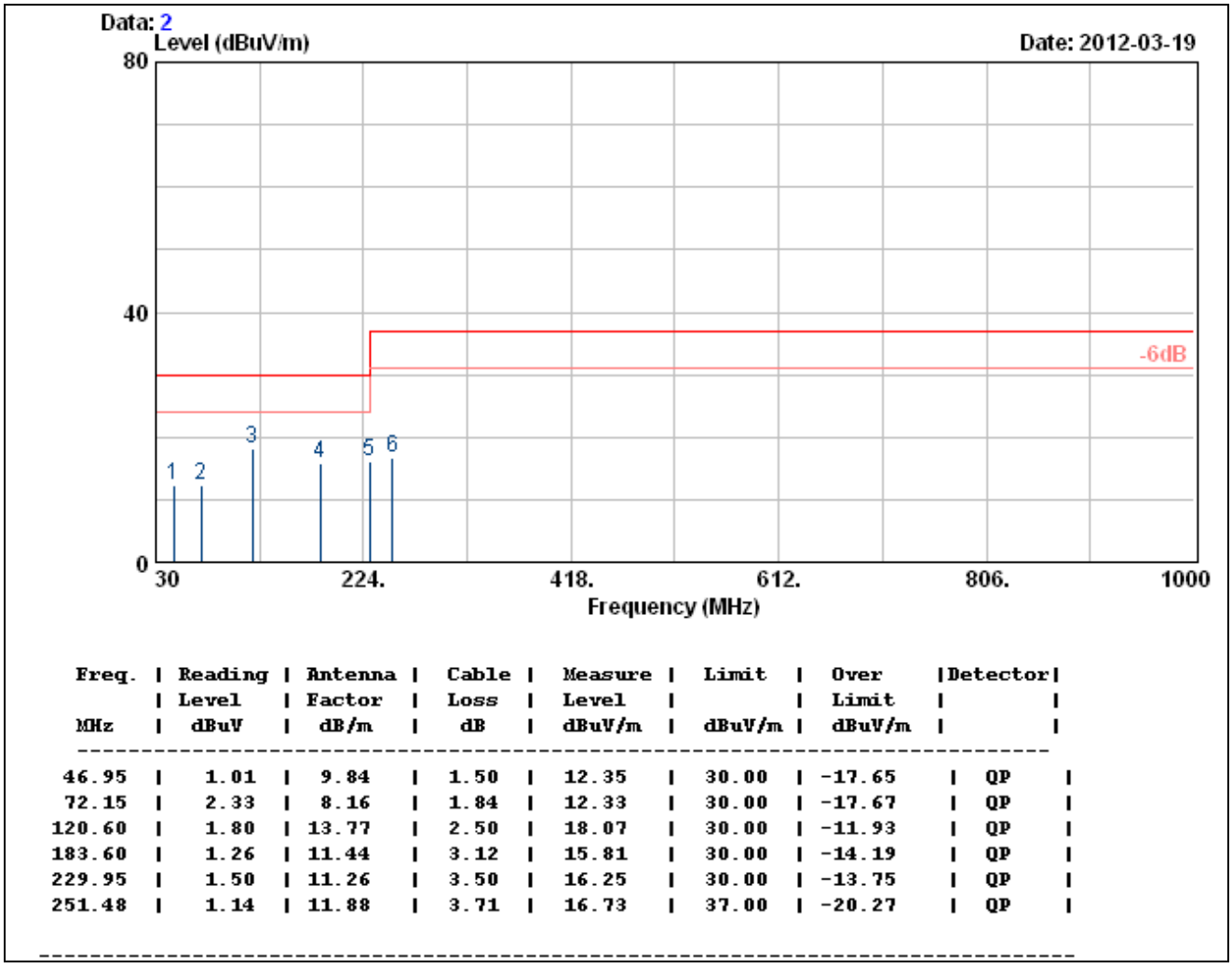
Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
55.88	1.47	7.66	1.62	10.75	30.00	-19.25	QP
84.45	1.23	7.75	2.04	11.02	30.00	-18.98	QP
121.18	1.28	13.74	2.50	17.51	30.00	-12.49	QP
150.90	1.31	12.70	2.69	16.69	30.00	-13.31	QP
222.03	1.72	10.91	3.42	16.05	30.00	-13.95	QP
248.60	1.24	11.83	3.68	16.75	37.00	-20.25	QP

Note:

1. QP= Quasi-peak Reading.
2. The other emission levels were very low against the limit.

Model No.	PUS-2415B3	Test Mode	Full Load
Environmental Conditions	25deg.C, 58% RH	6dB Bandwidth	120 kHz
Antenna Pole	Vertical	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Shiang Su

(The chart below shows the highest readings taken from the final data.)



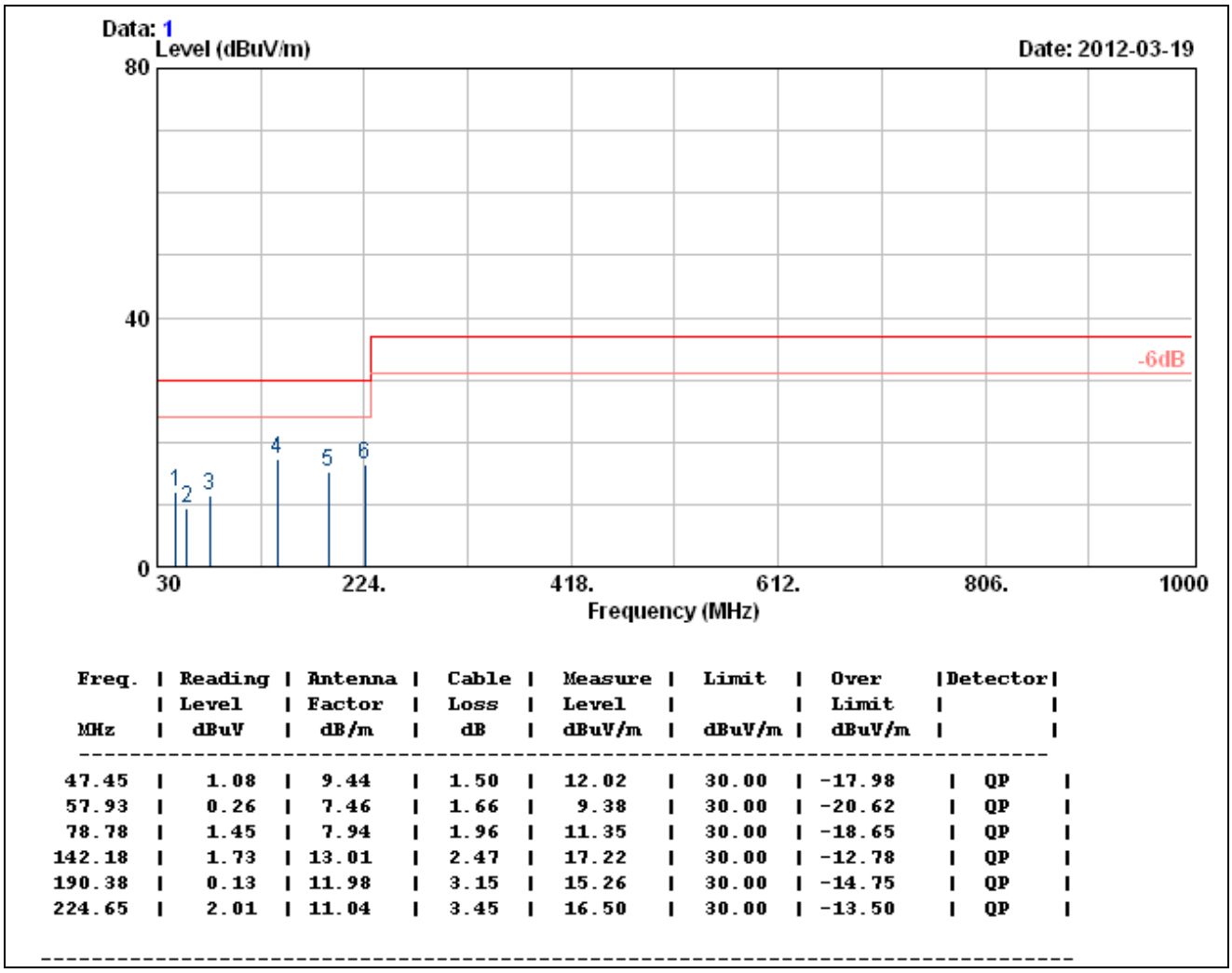
Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
46.95	1.01	9.84	1.50	12.35	30.00	-17.65	QP
72.15	2.33	8.16	1.84	12.33	30.00	-17.67	QP
120.60	1.80	13.77	2.50	18.07	30.00	-11.93	QP
183.60	1.26	11.44	3.12	15.81	30.00	-14.19	QP
229.95	1.50	11.26	3.50	16.25	30.00	-13.75	QP
251.48	1.14	11.88	3.71	16.73	37.00	-20.27	QP

Note:

1. QP= Quasi-peak Reading.
2. The other emission levels were very low against the limit.

Model No.	PUS-2415B3	Test Mode	Full Load
Environmental Conditions	25deg.C, 58% RH	6dB Bandwidth	120 kHz
Antenna Pole	Horizontal	Antenna Distance	10m
Detector Function	Quasi-peak.	Tested by	Shiang Su

(The chart below shows the highest readings taken from the final data.)



Freq. MHz	Reading Level dBuV	Antenna Factor dB/m	Cable Loss dB	Measure Level dBuV/m	Limit dBuV/m	Over Limit dBuV/m	Detector
47.45	1.08	9.44	1.50	12.02	30.00	-17.98	QP
57.93	0.26	7.46	1.66	9.38	30.00	-20.62	QP
78.78	1.45	7.94	1.96	11.35	30.00	-18.65	QP
142.18	1.73	13.01	2.47	17.22	30.00	-12.78	QP
190.38	0.13	11.98	3.15	15.26	30.00	-14.75	QP
224.65	2.01	11.04	3.45	16.50	30.00	-13.50	QP

Note:
1. QP= Quasi-peak Reading.
2. The other emission levels were very low against the limit.

Above 1GHz

※ No applicable, since the highest frequency of the internal sources of the EUT is less than 108MHz, the measurement shall only be made up to 1 GHz.

8 PHOTOGRAPHS OF THE TEST CONFIGURATION

RADIATED EMISSION TEST