IST EMC LAB.

E M I S S I O N T E S T R E P O R T

Test report file No. : **03-IST-236/FB**

Date of issue : Aug. 19, 2003

Model / Type No. : TN-550

■ Basic ☐ Alternate

Kind of product : MP3 Player

Brand name : TeraValue

Applicant : TeraValue Co., Ltd.

Manufacturer : TeraValue Co., Ltd.

License holder : TeraValue Co., Ltd.

Address : Suite 509, Kyonggi Venture Bldg., Korea Design Center, #344-1 Yatap-1dong, Bundang-Go, Sungnam-Si, Kyonggi-Do, Korea

Test result according to the regulation(s)

■ Positive ☐ Negative

at page 3.

This test report with appendix consists of 23 pages. The test result only responds to the tested sample.
It is not allowed to copy this report even partly without the allowance of the Test Laboratory.
This equipment is complied with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C63.4-1992.

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DIRECTORY

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TEST REGULATIONS

The tests were performed according to the following regulations ;

■ - FCC Part 15, Subpart B (Unintentional Radiators, Class B)

Information of Test Laboratory

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EQUIPMENT UNDER TEST

Equipment Description :

PC interface	USB
Audio format	MP3, WMA
Sampling Frequency	32 kHz / 44.1 kHz / 48 kHz
Download speed	5 Mbps
FM Noise Ratio	50 dB
Earphone Output	20 mW
File system	FAT 32/16 compatible

EUT Type :

☒ Table-Top. ☐ Floor-Standing.
☐ Table-Top and Floor-Standing(Combination).

Operation – mode of the E.U.T. :

The equipment under test was operated during the measurement under following conditions :

☐ Standby.
☒ Operational Condition : 1) Play Mode 2) Files Download Mode
3) Encoding Mode

Configuration of the equipment under test :

Following peripheral devices and interface cables were connected during the measurement :

Equipment	Type	Brand	Serial No.
PC	Vectra VL420MT	HP	SG23101784
Monitor	529B	Daewoo	Unknown
Keyboard	SK-2502C	HP	M020321066
PS/2 Mouse	M-S48a	HP	LZC20602926
Serial Mouse	M-S428	Logitech	LCA53305547
Printer	A0302384	Northern Telecom	26633S60168

Connecting Interface Cables :
- Unshielded AC power cable : 1.8 m
- Shielded monitor's signal cable (with two ferrite core) : 1.5 m
- Shielded printer's signal cable (with two ferrite core) : 1.8 m
- Unshielded USB cable (with two ferrite core) : 0.8 m
- Unshielded Audio I/O cable : 0.7 m

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TEST CONDITIONS

The **measurement of the conducted emissions (Interference voltage)** was performed in a shielded
room.

Test location :

☒ Shielded room. No.1 ☐ Compact chamber 2

Used testing instruments :

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESH 3	Test Receiver	Rohde & Schwarz	Jul. 22, 2003	892108/018
3725/2	LISN	EMCO	Jul. 23, 2003	9101-2068
KNW-407	LISN	Hyup-Rip	Jul. 23, 2003	8-883-10
ESH 3-Z2	Pulse Limiter	Rohde & Schwarz	Jul. 23, 2003	357.8810.52

Test - accessories :

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

Measurement Procedures :

Conducted emissions measurments were made in accordance with ANSI G-63.4-1992, "Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50? /50uH LISN as the input transducer to an EMI/Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within an IF bandwidth of 10kHz or for "quasi-peak" within a bandwidth of 9kHz.

All used test-instruments as well as the test-accessories are calibrated regularly.

Test engineer :

S. G. Kim / Research Engineer

IST EMC Lab.

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TEST CONDITIONS

The **measurement of the radiated emissions (Electric field)** in the frequency range from 30 MHz to 1GHz was performed in horizontal and vertical antenna polarization at a open-site which meet the site attenuation requirement of ANSI C63.4-1992 and a test distance of :

Location :	☐ Open Site No. 1	☒ Open Site No. 2	☐ Open Site No. 3
Distance :	☒ 3 meters	☐ 10 meters	

Used testing instruments :

Name	Type	Manufacturer	Calibration. Date	Serial Number
ESVP	Test Receiver	Rohde & Schwarz	Jul. 22, 2003	861744/004
VULB 9160	Antenna	Schwarzbeck	Jul. 09, 2003	3048

Test - accessories :

Type	Manufacturer
Aneroid Barometer	Sato
Hygrometer	Sato

Measurement procedures

Radiated measurements were in accordance with ANSI C63.4-1992 "Method of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a EMI/Field Intensity Meter. The measurements were made with the detector set for "quasi-peak" within a bandwidth of 120kHz.

All used test-instruments as well as the test-accessories are calibrated regularly.

Test engineer :

S. G. Kim / Research Engineer
IST EMC Lab.

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TEST RESULT

Conducted emissions : 150 kHz - 30 MHz

Operational Condition : Files Download Mode

The requirements are.

☒ KEPT ☐ NOT KEPT

Min. limit margin 18.5 dB at 0.249 MHz

Remarks : See test-data at pages 14 ~ 16.

Radiated emissions (electric field) 30 MHz - 1000 MHz

Operational Condition : Play Mode

The requirements are.

☒ KEPT ☐ NOT KEPT

Min. limit margin 4.3 dB at 282.4 MHz

Remarks : See test-data at page 17 ~ 18.

Radiated emissions (electric field) 30 MHz - 1000 MHz

Operational Condition : Encoding Mode

The requirements are.

☒ KEPT ☐ NOT KEPT

Min. limit margin 4.0 dB at 282.3 MHz

Remarks : See test-data at page 19 ~ 20.

Radiated emissions (electric field) 30 MHz - 1000 MHz

Operational Condition : Files Download Mode

The requirements are.

☒ KEPT ☐ NOT KEPT

Min. limit margin 9.4 dB at 66.7 MHz

Remarks : See test-data at page 21 ~ 22.

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Measurement Uncertainty Calculation

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994).

Contribution (Conducted Emissions)	Probability Distribution	Uncertainty (±dB) 0.15-30MHz
Receiver Specification	Rectangular	1.5
LISN Coupling Specification	Rectangular	1.5
Cable and Input Attenuator Calibration	Normal (k=2)	0.5
Mismatch to Reciver	U-Shaped	-0.8 / +0.7
System Repeatability	Normal (k=1)	0.2
Combined Standard Uncertainty	Normal (k=2)	-1.85 / +1.71
Expanded Uncertainty U	Normal (k=2)	-3.7 / +3.42

$U_{c,\min us}$ = -1.85, $U_{c,plus}$ = 1.71

U = -3.70 / +3.42 (k=2, 95.45% confidence level)

Contribution (Radiated Emissions)	Probability Distribution	Uncertainties(±dB) 3 m
Antenna		
Factor	Normal (k=2)	0.9968
Frequency Interpolation	Rectangular	0.1039
Height Variation	Rectangular	-2.6 / +1.5
Directivity Difference	Rectangular	-1.0 / +0
Phase Center Location	Rectangular	1.0
Cable Loss	Normal (k=2)	0.5
Receiver		
Voltage Accuracy	Normal (k=2)	2.0
Pulse Response	Rectangular	1.5
Absolute Repetition Rate	Rectangular	1.5
Mismatch to Receiver $\lvert G_{antenna} \rvert = 0.33$ $\lvert G_{receiver} \rvert = 0.33$	U-Shaped	-1.0 / +0.9
System Repeatibility	Std Deviation	0.5
Combined Standard Uncertainty	Normal	-2.6048 / 2.2775
Expanded Uncertainty U	Normal (k=2)	-5.21 / +4.55

$U_{c,\min us}$ = -2.6048, $U_{c,plus}$ = 2.2775

U = -5.21 / +4.55 (k=2, 95.45% confidence level)

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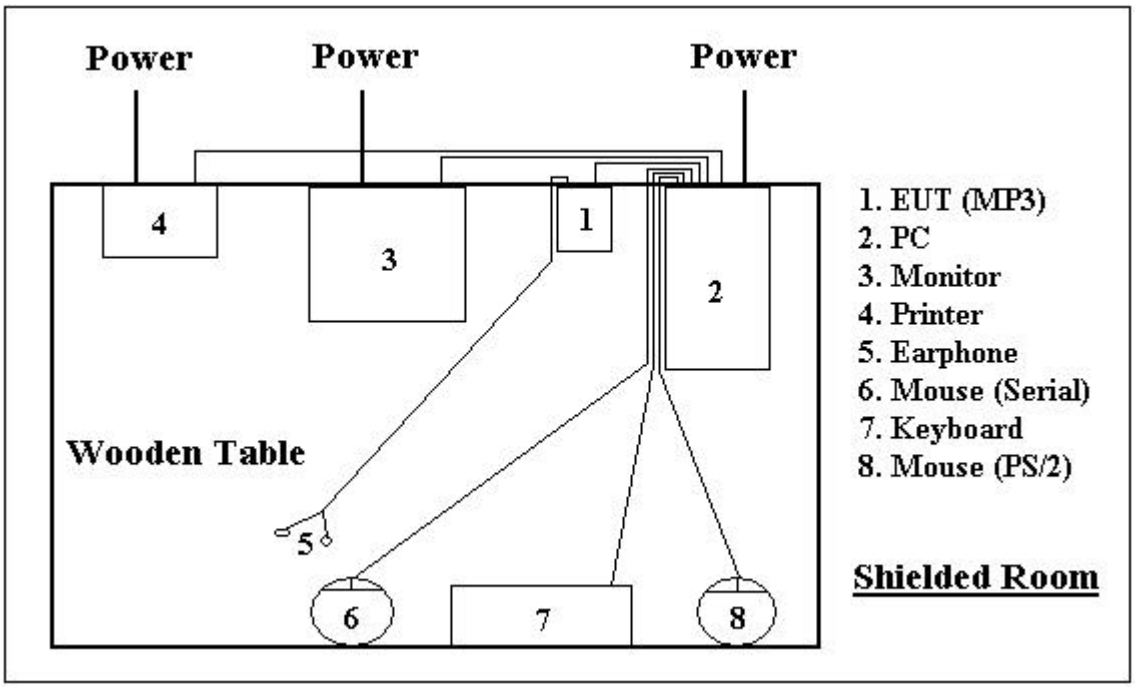
TEST SETUP (Drawings)

Type : TN-550



Conducted Emissions 150kHz - 30 MHz

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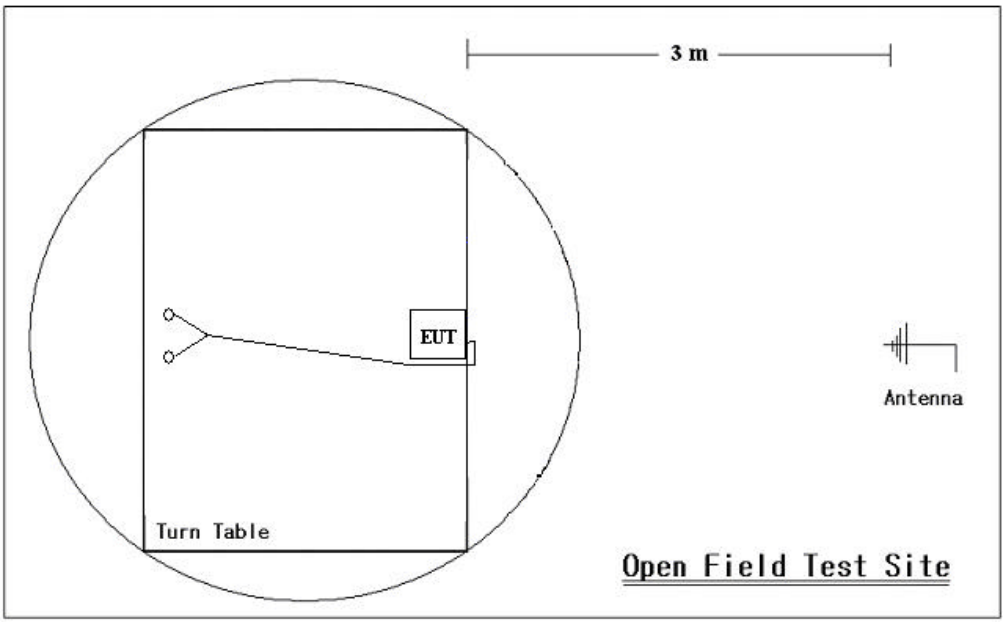
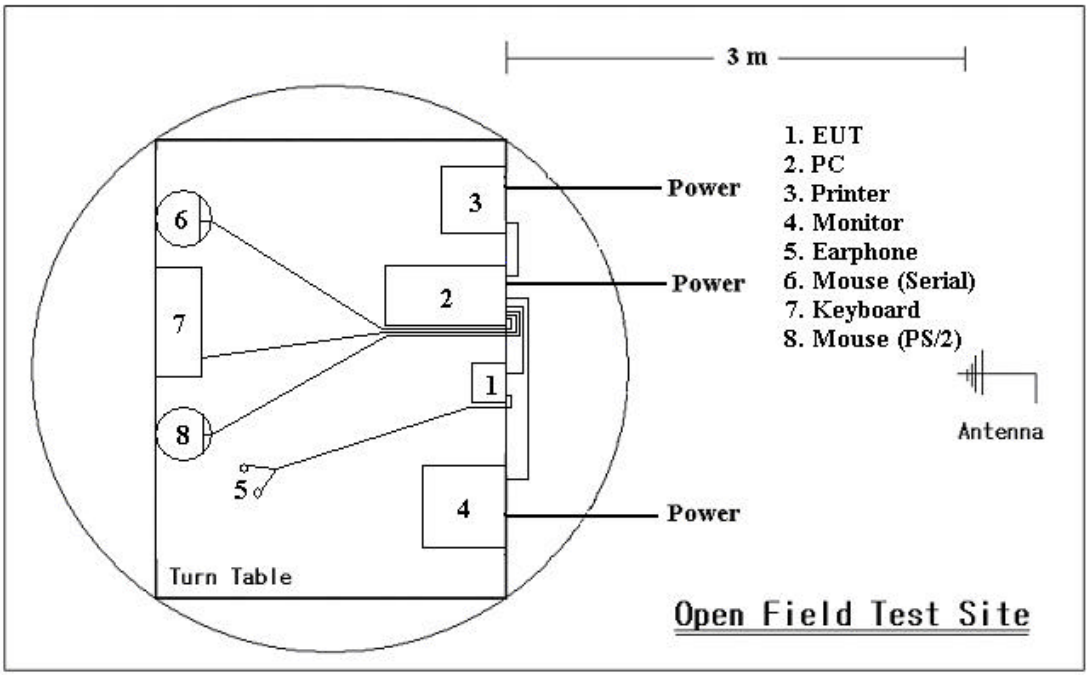
TEST SETUP (Drawings)

Type : TN-550



Radiated Emissions (Play Mode / Encoding Mode)



Radiated Emissions (Files Download Mode)

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TEST SETUP (Photos)

Type : TN-550

Conducted Emissions 150kHz - 30 MHz

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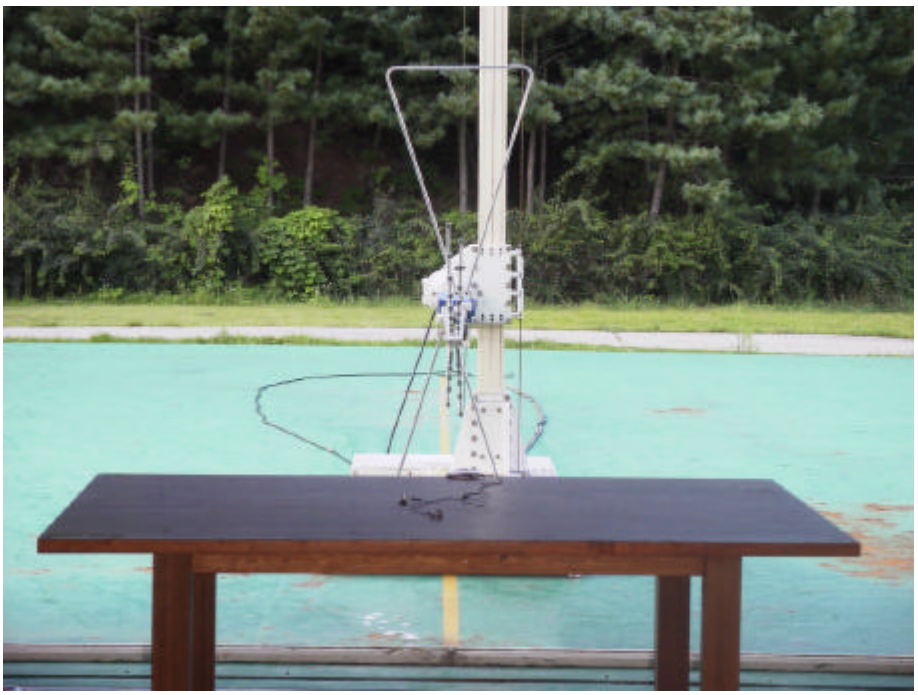
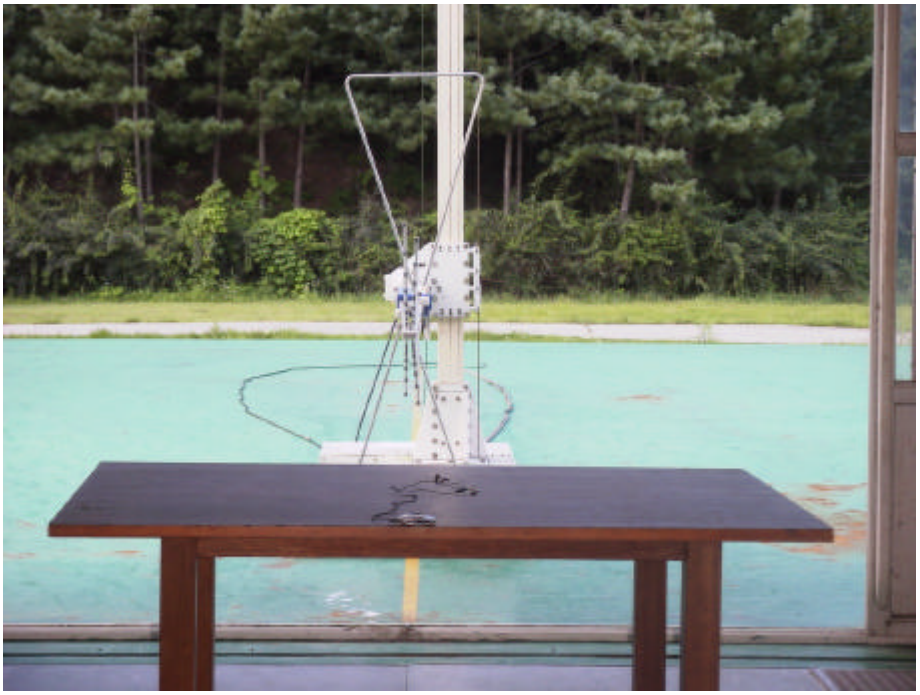
TEST SETUP (Photos)

Type : TN-550



Radiated Emissions 30MHz - 1000 MHz (Play Mode / Encoding Mode)



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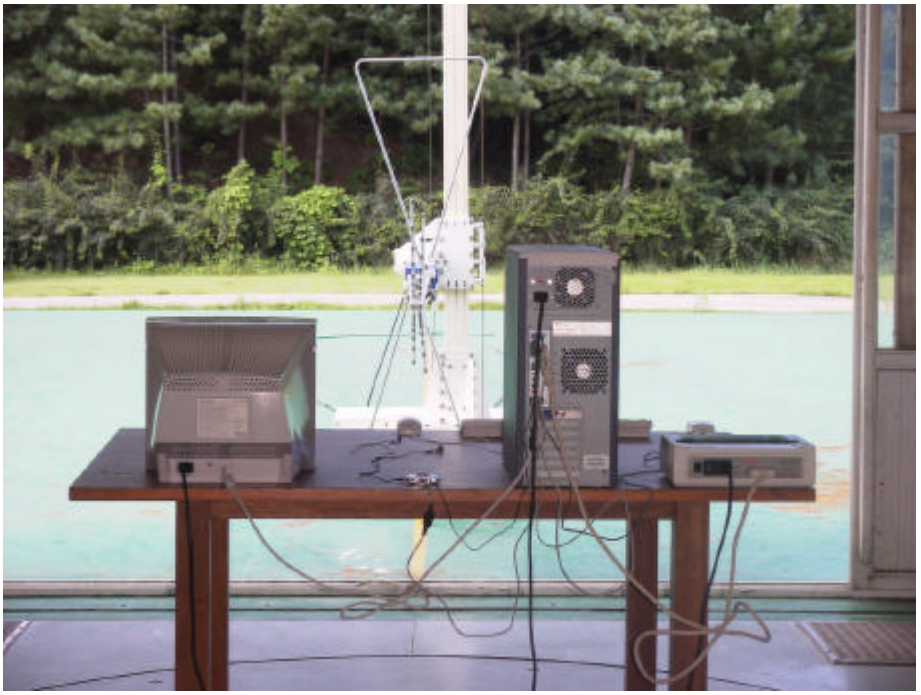
TEST SETUP (Photos)

Type : IMP400

Radiated Emissions 30MHz - 1000 MHz (Files Download Mode)



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Conducted Emission Test Data

Type	TN-550		
Manufacturer	TeraValue Co., Ltd.		
Operation mode	Files Download Mode		
Environmental Conditon	Temperature	:	25 ?C
	Humidity	:	46 %
	Atmospheric pressure	:	1014 mbar
Date	Aug. 11, 2003		

Highest Emissions ralative to the limit

Frequency [MHz]	Reading [dB?V]		Phase	Insertion Loss (LISN)	Limit [dB?V]		Margin [dB]	
	Q-peak	AV			Q-peak	AV	Q-peak	AV
0.196	26.4	22.9	L1	0.8	63.8	53.8	36.6	30.1
0.250	32.2	27.2		0.8	61.8	51.8	28.8	23.8
0.624	21.3	19.7		0.8	56.0	46.0	33.9	25.5
1.498	23.0	19.0		0.8	56.0	46.0	32.2	26.2
6.867	23.1	21.1		0.8	60.0	50.0	36.1	28.1
14.322	30.5	29.5		0.8	60.0	50.0	28.7	19.7
0.150	23.9	8.1	N	0.8	66.0	56.0	41.3	47.1
0.249	33.2	32.5		0.8	61.8	51.8	27.8	18.5
0.704	22.3	22.2		0.8	56.0	46.0	32.9	23.0
0.874	24.5	23.7		0.8	56.0	46.0	30.7	21.5
8.367	24.0	21.9		0.8	60.0	50.0	35.2	27.3
14.558	28.9	27.3		0.8	60.0	50.0	30.3	21.9
Cable loss are less than 0.1 dB								

*L1 : Live Line

**N : Neutral Line

*** **Please refer to data graphs at page 15 ~ 16.**

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -3.70 / +3.42 [dB]

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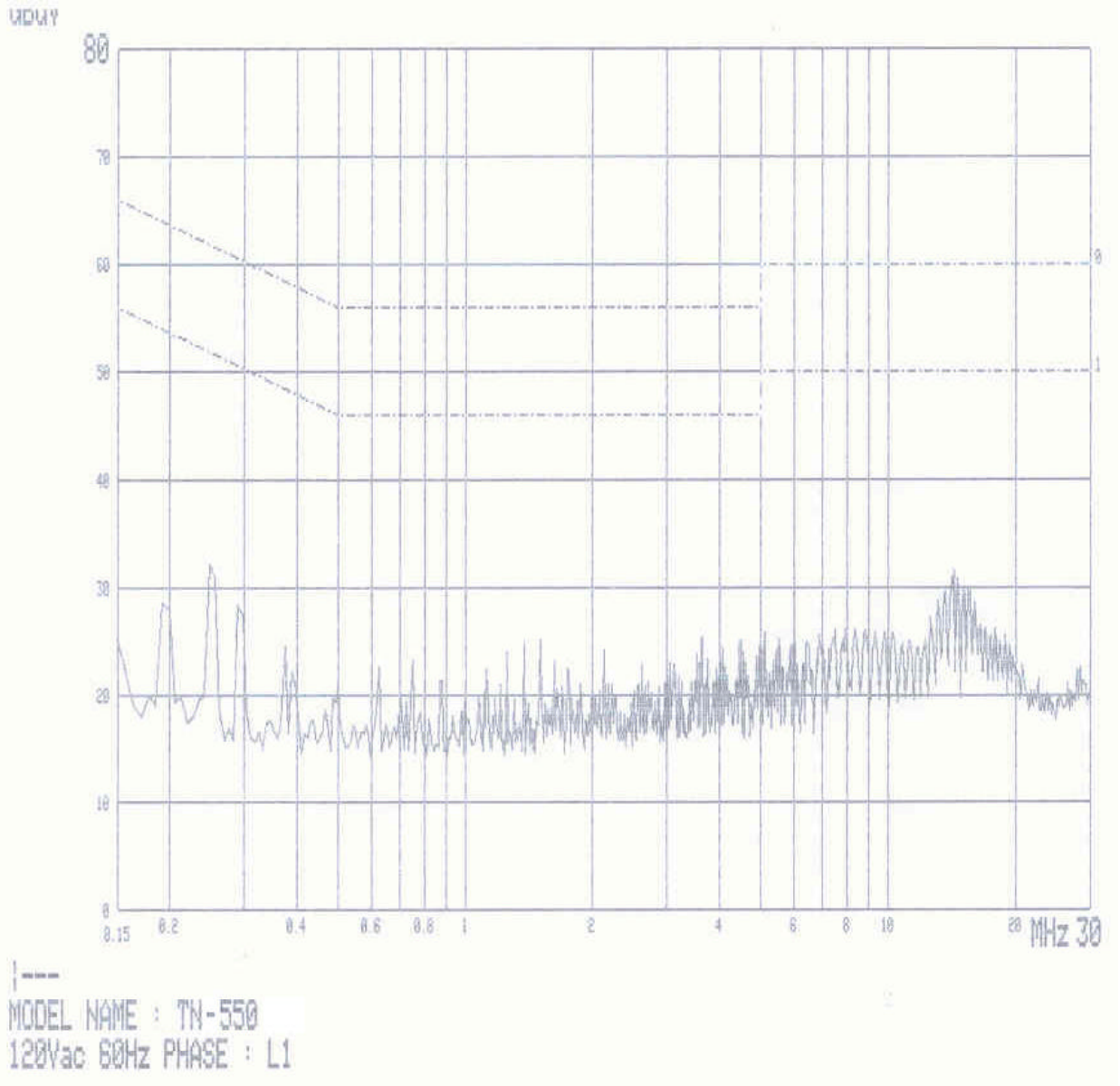

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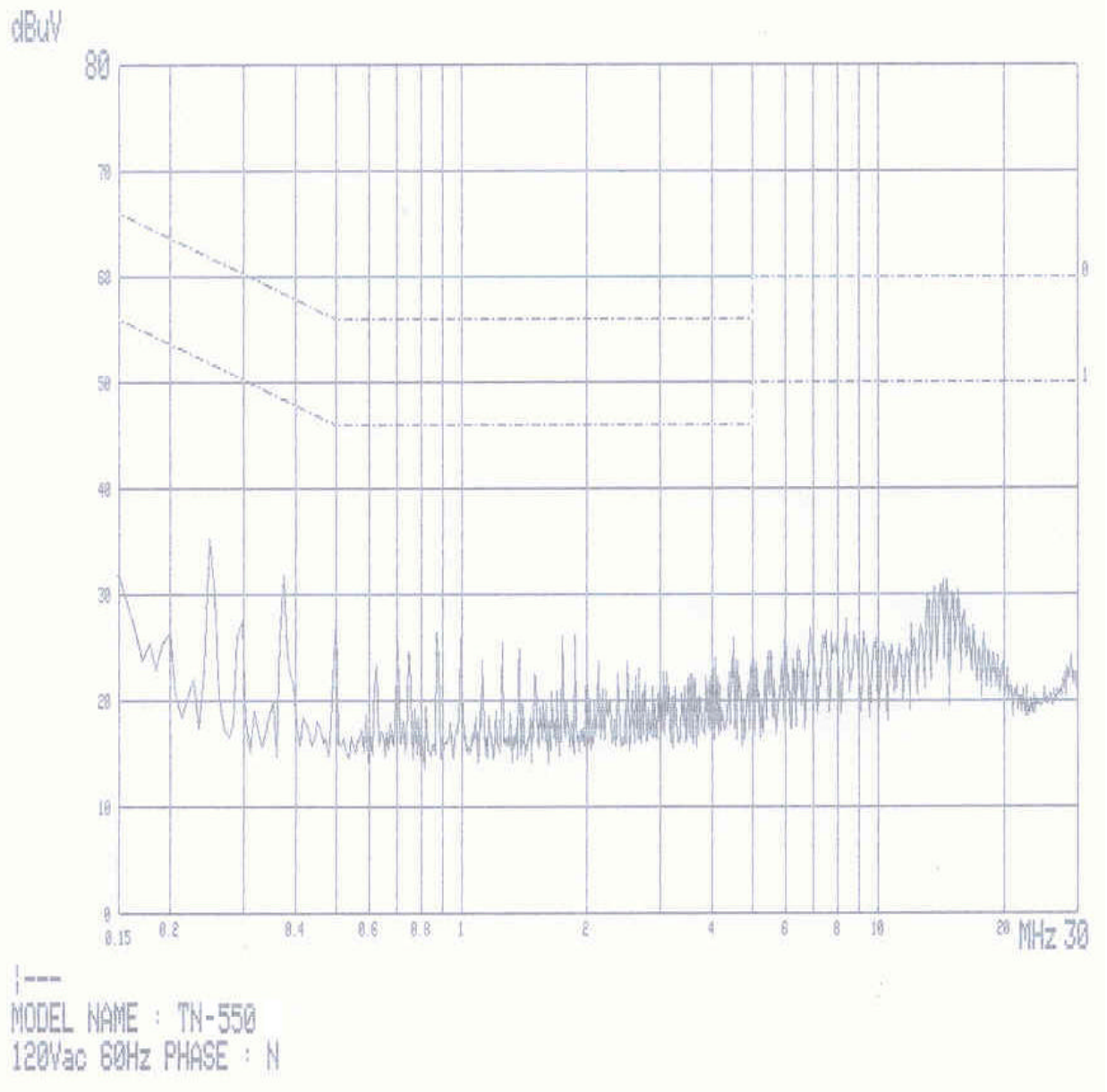

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Radiation Test Data

Type	TN-550		
Manufacturer	TeraValue Co., Ltd.		
Operation mode	Play Mode		
Environmental Conditon	Temperature	:	28 ?C
	Humidity	:	45 %
	Atmospheric pressure	:	1014 mbar
Test distance	3 m		
Antenna	VULB9160		
Date	Aug. 12, 2003		

Highest Emissions ralative to the limit

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB]	Cable Loss [dB]	Angle [deg]	Height [cm]	Polar [H/V]	Result [dBuV]	Limit [dBuV]	Margin [dB]
97.4	20.0	9.3	2.2	12	100	V	31.5	43.5	12.0
98.6	23.8	9.5	2.2	10	100	V	35.5	43.5	8.0
113.2	17.3	10.5	2.5	11	100	V	30.3	43.5	13.2
123.0	20.3	11.7	2.7	0	100	V	34.7	43.5	8.8
135.4	19.1	12.2	2.8	0	100	V	34.1	43.5	9.4
181.2	23.1	10.8	3.2	13	100	V	37.1	43.5	6.4
196.8	23.8	9.5	3.3	210	100	V	36.6	43.5	6.9
215.0	23.8	9.4	3.5	200	120	H	36.7	43.5	6.8
282.4	25.9	11.9	4.2	200	121	H	41.7	46.0	4.3
304.7	23.3	12.5	4.4	210	130	H	40.2	46.0	5.8
316.2	23.3	12.8	4.5	0	100	V	40.6	46.0	5.4
338.6	21.9	13.4	4.7	10	100	V	40.0	46.0	6.0
350.1	22.2	13.6	4.8	191	100	V	40.6	46.0	5.4
372.5	21.4	14.1	5.0	190	219	H	40.5	46.0	5.5
417.9	17.6	15.2	5.3	200	200	H	38.1	46.0	7.9

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -5.21 / +4.55 [dB]

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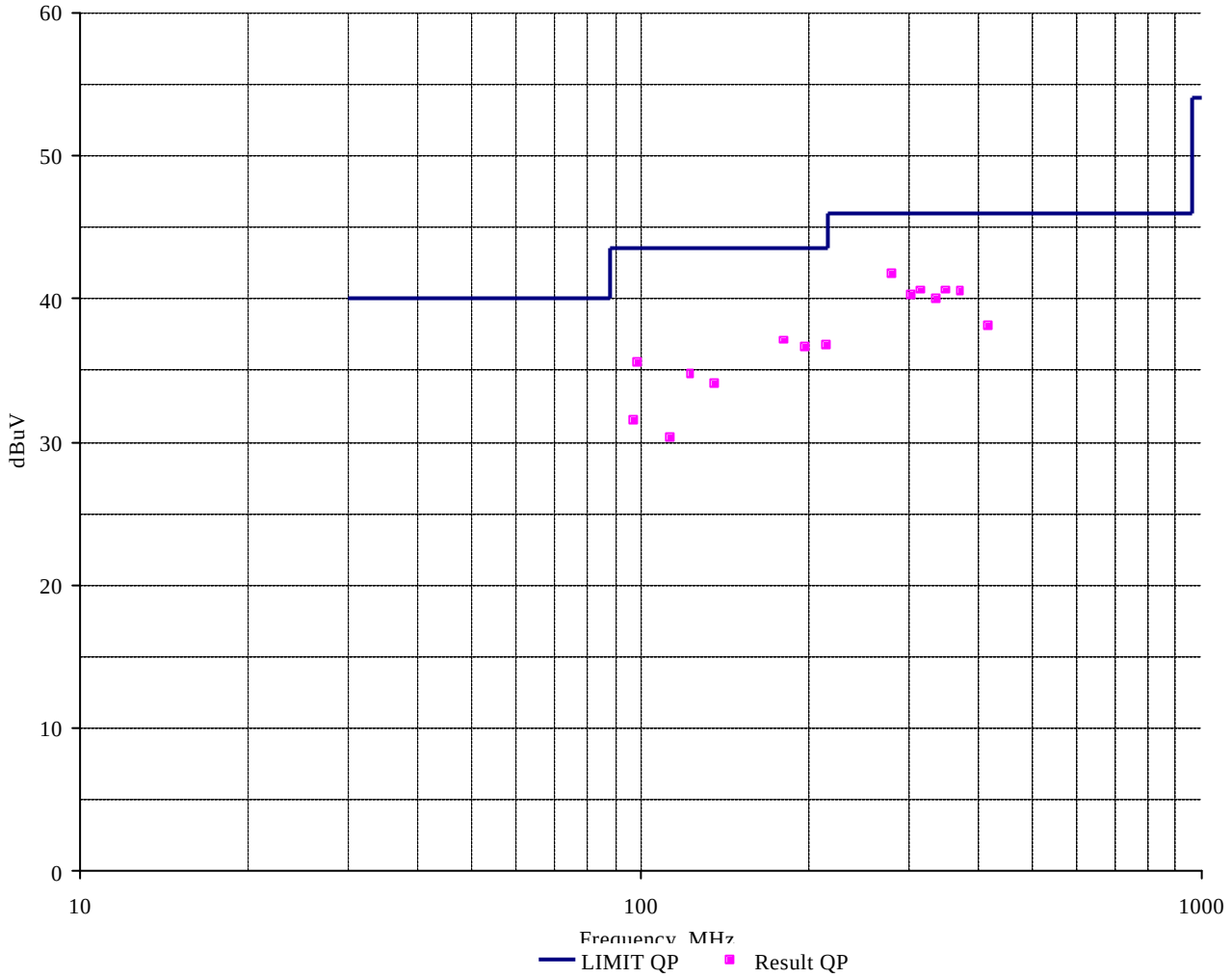
MEASUREMENT OF DISTURBANCE RADIATION



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Radiation Test Data

Type	TN-550		
Manufacturer	TeraValue Co., Ltd.		
Operation mode	Encoding Mode		
Environmental Conditon	Temperature	:	28 ?C
	Humidity	:	45 %
	Atmospheric pressure	:	1014 mbar
Test distance	3 m		
Antenna	VULB9160		
Date	Aug. 12, 2003		

Highest Emissions ralative to the limit

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB]	Cable Loss [dB]	Angle [deg]	Height [cm]	Polar [H/V]	Result [dBuV]	Limit [dBuV]	Margin [dB]
97.4	19.8	9.3	2.2	12	100	V	31.3	43.5	12.2
98.5	23.3	9.5	2.2	10	100	V	35.0	43.5	8.5
113.3	17.1	10.5	2.5	11	100	V	30.1	43.5	13.4
123.1	20.0	11.7	2.7	0	100	V	34.4	43.5	9.1
135.4	19.1	12.2	2.8	0	100	V	34.1	43.5	9.4
181.2	24.4	10.8	3.2	13	100	V	38.4	43.5	5.1
215.1	25.1	9.4	3.5	200	120	H	38.0	43.5	5.5
282.3	25.9	11.9	4.2	200	121	H	42.0	46.0	4.0
304.7	22.5	12.5	4.4	210	130	H	39.4	46.0	6.6
316.3	22.0	12.8	4.5	0	100	V	39.3	46.0	6.7
350.2	21.8	13.6	4.8	191	100	V	40.2	46.0	5.8
372.5	20.2	14.1	5.0	199	210	H	39.3	46.0	6.7
417.9	17.7	15.2	5.3	200	200	H	38.2	46.0	7.8

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -5.21 / +4.55 [dB]

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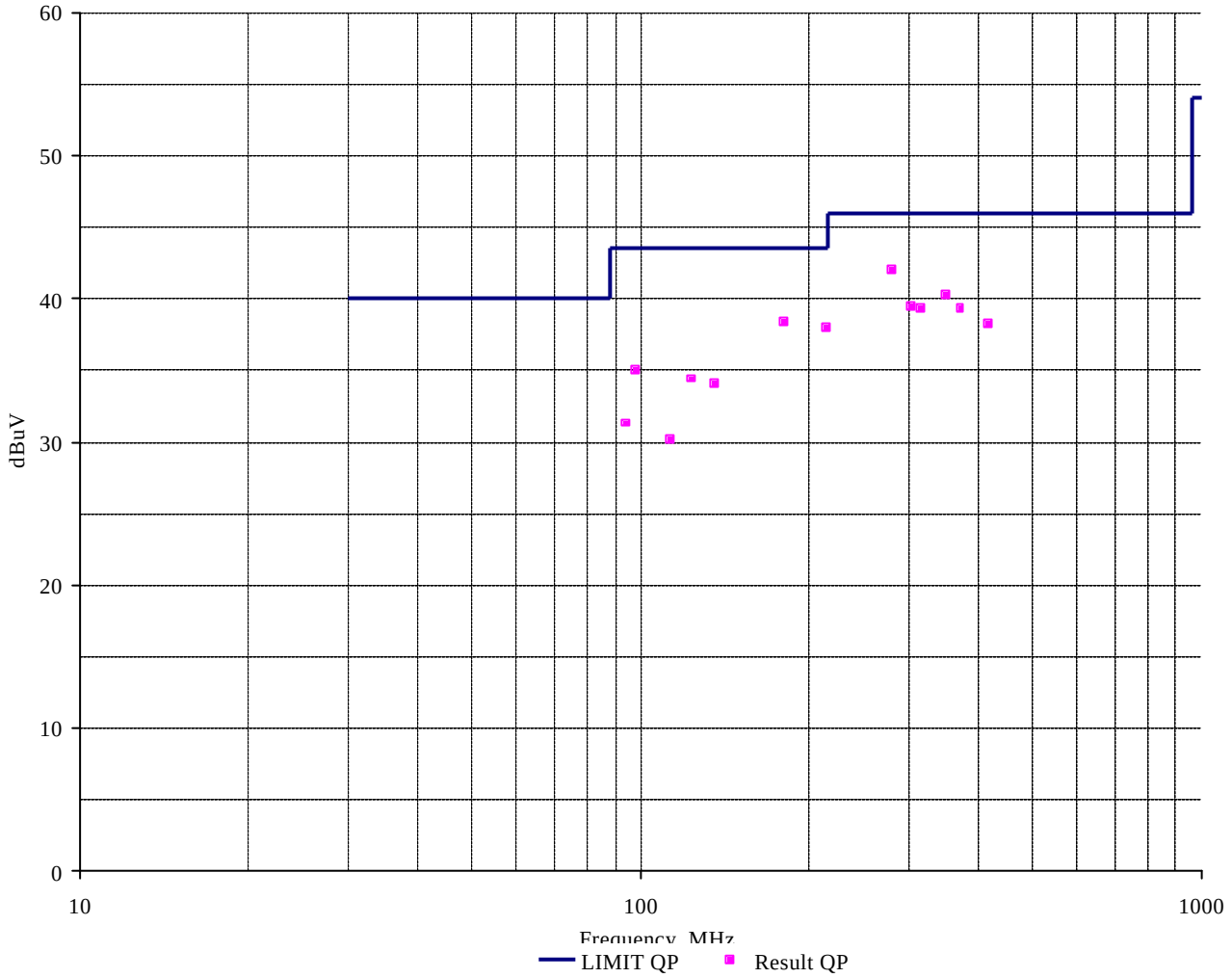
MEASUREMENT OF DISTURBANCE RADIATION



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Radiation Test Data

Type	TN-550		
Manufacturer	TeraValue Co., Ltd.		
Operation mode	Files Download Mode		
Environmental Conditon	Temperature	:	28 ?C
	Humidity	:	45 %
	Atmospheric pressure	:	1014 mbar
Test distance	3 m		
Antenna	VULB9160		
Date	Aug. 13, 2003		

Highest Emissions ralative to the limit

Freq. [MHz]	Reading [dBuV]	Antenna Factor [dB]	Cable Loss [dB]	Angle [deg]	Height [cm]	Polar [H/V]	Result [dBuV]	Limit [dBuV]	Margin [dB]
46.1	10.4	11.6	1.3	106	100	V	23.3	40.0	16.7
66.7	18.6	10.2	1.8	0	100	V	30.6	40.0	9.4
71.3	18.1	9.5	1.9	10	100	V	29.5	40.0	10.5
141.0	13.8	12.2	2.8	62	100	V	28.8	43.5	14.7
161.6	10.9	12.8	2.9	63	180	H	26.5	43.5	17.0
207.3	11.1	9.2	3.4	58	100	V	23.7	43.5	19.8
226.4	12.1	10.0	3.7	135	100	V	25.8	46.0	20.2
285.5	14.4	12.1	4.2	0	100	V	30.7	46.0	15.3
290.4	13.8	12.2	4.2	0	100	V	30.2	46.0	15.8
300.3	13.6	12.5	4.4	10	100	V	30.5	46.0	15.5
324.9	13.7	13.0	4.6	9	100	V	31.3	46.0	14.7

Coverage factor of k=2 will ensure that the level of confidence will be approximately 95.45%,
Uncertainty U = -5.21 / +4.55 [dB]

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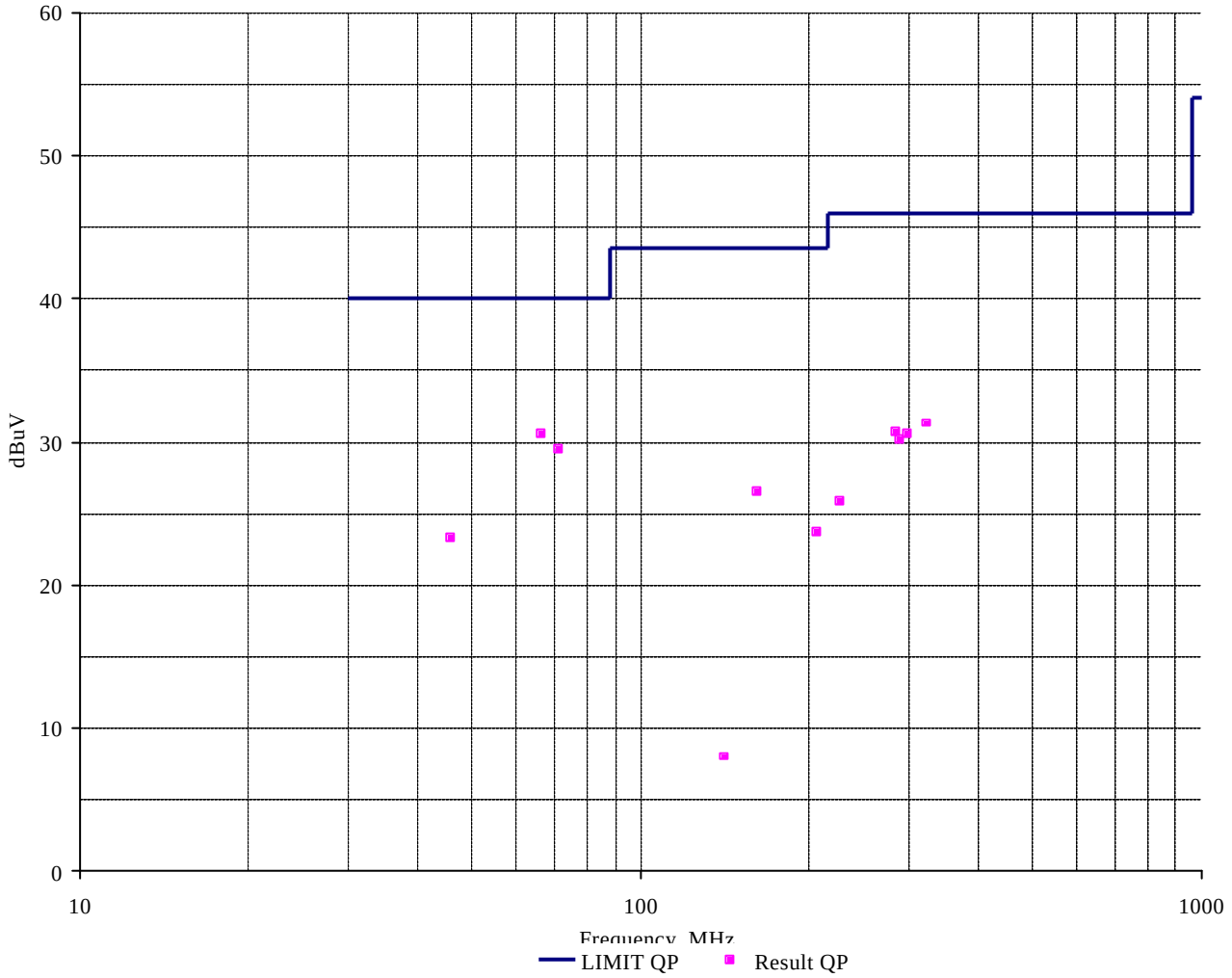
MEASUREMENT OF DISTURBANCE RADIATION



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SUMMARY

GENERAL REMARKS :

The equipment is not modified anything, mechanical or circuit to improve EMI status during a measurement and complied the regulation "Part 15 subpart B Class B of CFR 47"

FINAL JUDGMENT :

The requirements according to the technical regulations are

☒ Kept ☐ Not kept

The equipment under test does

☒ Fulfill the general approval requirements mentioned on page 3.
☐ Not fulfill the general approval requirements mentioned on page 3.

Begin of testing : Aug. 11, 2003

End of testing : Aug. 14, 2003

Reviewed by	Issued by
Joon H. Lee / EMC Group Manager	G. Chung / Chief

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