

Comparison of Alternative Conducted Disturbance Test Arrangement Specified in CISPR22

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Abstract— Reference method with regard to conducted disturbance measurement at AC mains port and radiated disturbance from enclosure port are highlighted in the discussion of multimedia products disturbance standard at WG2 of CISPR/SC-I. Especially, for the conducted disturbance measurement at mains port, the experiment result of two test arrangements was reviewed with a typical EUT which was made typical system configuration of a Desk top PC, an 18-inch liquid crystal monitor, an USB mouse and a keyboard. The size of the whole system became about 1m x 1m. And the differences of the data between arrangements using the vertical ground reference plane and the horizontal ground reference plane was less than 1 dB.

Keywords-component; CISPR22; Electromagnetics Interference measurement; Conducted disturbance voltage; Alternative test method;

I. INTRODUCTION

To measure the conducted RF disturbances voltage at the AC mains port on Desk top equipment, two types of test arrangement (actually three types) using vertical ground reference plane and horizontal ground reference plane have been specified as an alternative method in CISPR22[1].

This experiment measurement was conducted to investigate the difference of the conducted disturbance voltage at the AC mains port on Desk top PC system depending on the alternative test arrangement.

II. TEST ARRANGEMENT AND MEASUREMENT CONDITIONS

The experiment was performed with three kinds of arrangement in a semi-anechoic chamber for the 10 meter distance radiated disturbance measurement. Two of them are the arrangement using vertical ground reference plane with 80 cm height table on the conductive metal floor and on the non-

conductive floor. The condition of non-conductive floor was simulated by making the 1.8 m height upper surface of table from the metal floor.

And another arrangement was set with 40 cm height table on the metal floor for the horizontal ground reference plane.

These three test arrangements in this experiment correspond to the alternative arrangement specified in CISPR22 for the conducted disturbance measurement at AC mains port.

Moreover, the liquid crystal surface of display monitor that composed the PC system was arranged in two positions against the ground reference plane. Total six test conditions from condition A to Condition F are shown in Fig. 1 to Fig. 6. Fig. 1 and 2 for the condition A and B correspond to alternative 2 given in the Figure 7 of CISPR22. Fig. 3 and Fig. 4 for the condition C and D correspond to alternative 1a shown in the Figure 5 of CISPR22. And Fig. 5 and 6 for the condition E and F correspond to alternative 1b shown in the Figure 6 of CISPR22.

Experiment measurement was performed with AC mains port of the Desk top PC and mains port of the liquid crystal display monitor. The monitor was displayed H pattern of a white character on a black screen and the communication of the Ether net port of the Desk top PC was an inactive condition.

Total six test conditions are summarized in Table 1.

Table 1 Summary of Test arrangement

Test Condition	Ground Reference Plane (GRP)	Metal plane bonding to AMN	Table Height	GRP facing to the LCD monitor surface	Example of Test arrangement described in CISPR22
A	Horizontal	Horizontal	40 cm	Perpendicular	Alternative 2
B	Horizontal	Horizontal	40 cm	Parallel	Alternative 2
C	Vertical	Horizontal	80 cm	Perpendicular	Alternative 1a
D	Vertical	Horizontal	80 cm	Parallel	Alternative 1a
E	Vertical	Vertical	180 cm	Perpendicular	Alternative 1b
F	Vertical	Vertical	180 cm	Parallel	Alternative 1b

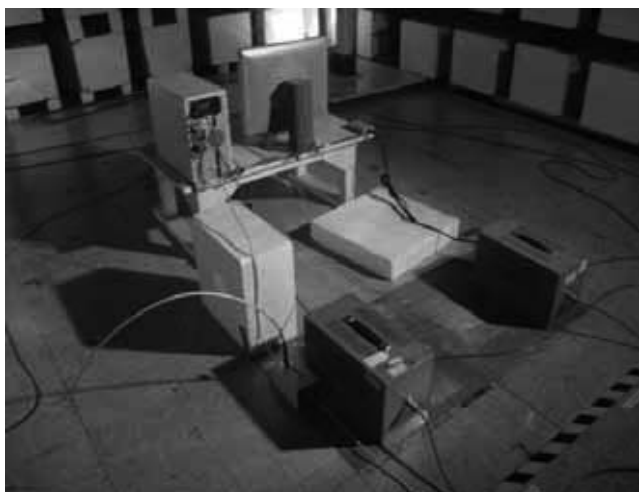


Fig. 1 Test Condition A



Fig. 4 Test Condition D



Fig. 2 Test condition B



Fig. 5 Test Condition E



Fig. 3 Test Condition C



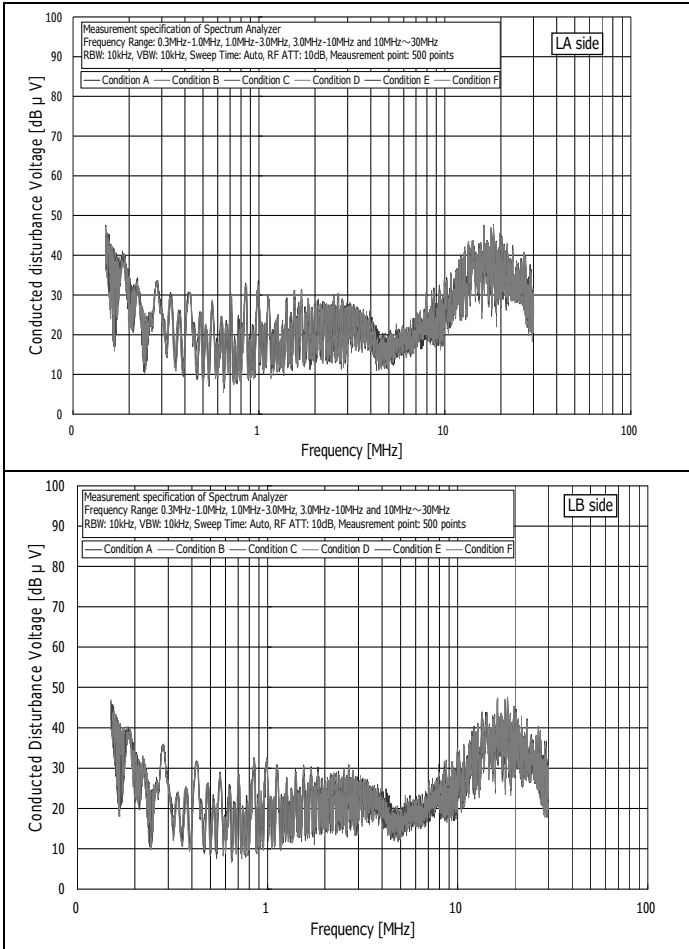
Fig. 6 Test Condition F

III. EXPERIMENT RESULTS

Conducted disturbance voltage at the AC mains port of Desk top PC and LCD monitor were measured with peak detector of the Max-hold trace function of spectrum analyzer.

A. Measurement Data at AC mains port of Desk top PC

Measurement data at the AC mains port of Desk top PC with six conditions of test arrangement are shown in Fig. 7.



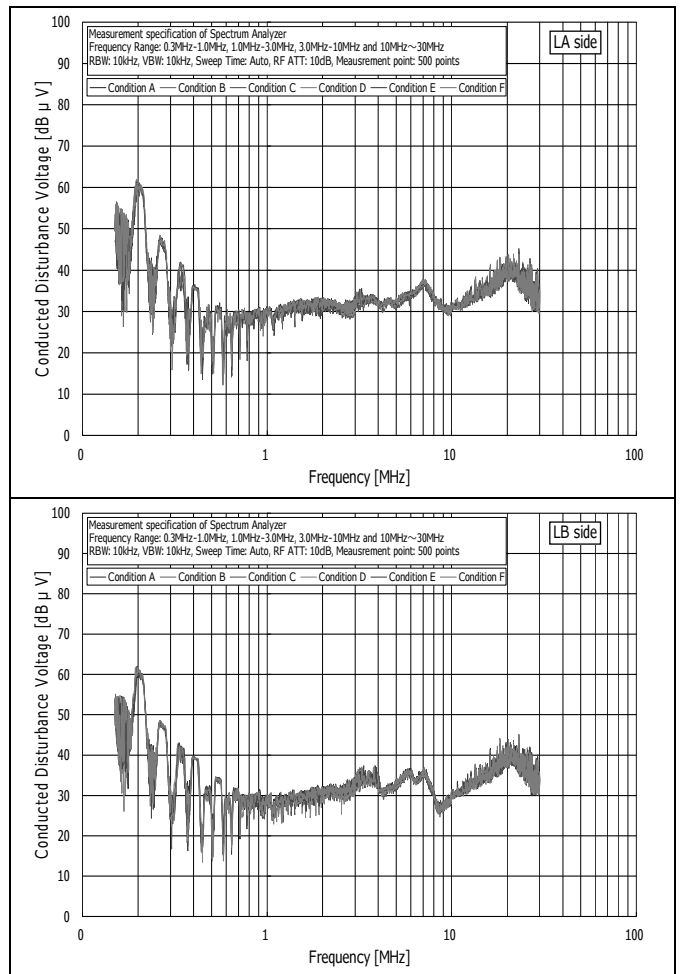
Upper figure: the data of Phase-A line (LA side) at AC mains port of Desk top PC (Phase-A line is one of two lines of AC power cord)

Lower figure: the data of phase-B line (LB side) at AC mains port of Desk top PC (Phase-B line is the other line of AC power cord)

Fig. 7: Conducted disturbance voltage spectrum at AC mains port of Desk top PC

B) Measurement Data at AC mains port of LCD Monitor

Measurement data at the AC mains port of LCD monitor with six conditions of test arrangement are shown in Fig. 8.



Upper figure: the data of Phase-A line (LA) at AC mains port of LCD Monitor (Phase-A line is one of two lines of AC power cord)

Lower figure: the data of phase-B line (LB) at AC mains port of LCD Monitor (Phase-B line is the other line of AC power cord)

Fig. 8 Conducted disturbance voltage spectrum at AC mains port of LCD Monitor

IV. SUMMARY OF THE RESULT

A) AC mains port of Desk top PC

Measurement values of 7 frequencies in six conditions at AC mains port of Desk top PC are shown in Table 2 and Figure 9.

Table 2 QP Voltage at AC mains port of Desk top PC(dBuV)

Frequency (MHz)	Condition A	Condition B	Condition C	Condition D	Condition E	Condition F
0.15	35.84	36.12	35.57	35.7	35.97	35.57
0.18	37.42	37.53	37.13	37.02	37.26	37.13
0.28	31.91	33.91	31.67	31.48	31.81	31.78
0.98	30.35	30.28	30.21	29.88	30.3	30.31
1.69	25.87	25.94	25.85	25.24	26.01	26.03
10.1	31.41	31.56	31.21	31.03	31.2	31.45
16.2	45.75	45.72	45.23	45.15	45.88	45.86

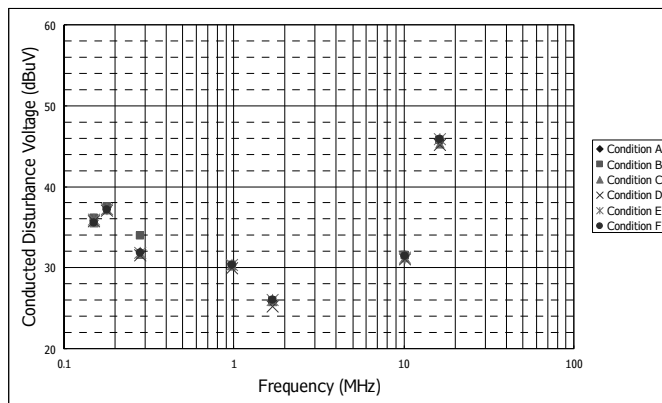


Fig. 9 Measurement data of 7 frequencies in six conditions at AC mains port of Desk top PC

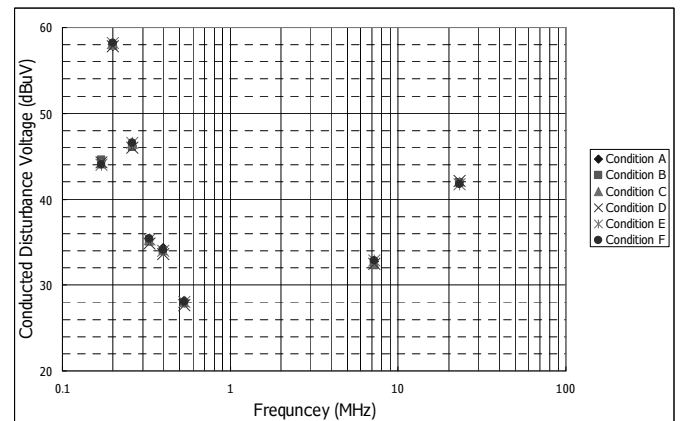


Fig. 10 Measurement data of 8 frequencies in six conditions at AC mains port of LCD Monitor

B) AC mains port of LCD Monitor

Measurement values of 8 frequencies in six conditions at AC mains port of LCD monitor are shown in Table 3 and Figure 10.

Table 3 QP Voltage at AC mains port of LCD Monitor (dBuV)

Frequency (MHz)	Condition A	Condition B	Condition C	Condition D	Condition E	Condition F
0.17	44.45	44.54	44.16	44.28	44.04	44.01
0.20	57.84	57.94	57.94	57.84	58.21	58.17
0.26	46.23	46.09	46.38	46.04	46.56	46.60
0.33	35.28	35.18	35.11	34.80	35.32	35.40
0.40	34.34	33.96	33.99	33.64	34.02	34.10
0.53	28.20	27.93	27.95	27.67	28.04	28.06
7.20	32.80	32.34	32.47	32.52	32.86	32.86
23.13	42.05	41.92	42.05	42.15	41.73	41.73

The measurement frequencies shown in Table 2 and Table 3 were chosen comparatively high level of disturbances in each AC power port of the Desk top PC and the LCD monitor. The difference of measurement value in six testing arrangements was able to be seen from Fig. 9 to Fig. 10.

V. CONCLUSION

The differences between the data using the vertical ground reference plane and the horizontal ground reference plane are almost less than 1 dB from measurement values in each frequency of Table 2 and Table 3.

Based on this experiment result, these test arrangements described in CISPR22 can be considered as comparable from the view point of the measurement instrumentation uncertainty of the measurement facility and equipment.

We therefore concluded it is not necessary to specify the referee arrangement in CISPR 22 for the conducted disturbance measurement of AC mains port based on this result.

ACKNOWLEDGMENT

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REFERENCES

- [1] CISPR22 standard: Information technology equipment – Radio disturbance characteristic – Limits and methods of measurement