

Good way to master the EMI precompliance test system - EMI total test system MR2300 -



1. Abstract

As for the EMI test, it is evaluated whether the radiated emission or the conducted emission discharged from EUT (Equipment Under Test) exceeds the limit value set beforehand. This test is generally done at the formal EMI test site equipped with the anechoic chamber.

It seems to be actual that much waiting time and cost are needed there and longer time and more cost are wasted there when it is repeated many times to solve the problem and to test formally.

The EMI total test system MR2300, which focuses on being used to solve the problem in advance « Precompliance » and reducing the number of times of formal test to one or two times, is introduced in this paper.

2. EMI total test system

MR2300 is a complete and total test system including not only a compact broadband antenna, a spectrum analyzer for EMI, LISN and PC software for EMI

but also an anechoic box.

The system configuration of MR2300 is shown in Fig.1. This system can do (1) the radiated emission measurement in the frequency range 30MHz to 3GHz by using an anechoic box and a broadband antenna, (2) the conducted emission measurement in the frequency range 150kHz to 30MHz by using LISN.

Moreover, the measurement values on the screen of a computer can be directly read because Spectrum analyzer for EMI MSA338E and PC software MAS230 correct the frequency characteristics of the antenna gain, the conversion into 3 meters in measurement distance and the attenuation of LISN. Therefore, the user can easily do the EMI test.

3. Test example

A few important points about the measurement are described as follows as an example of the radiated emission test of a keyless entry of a car.

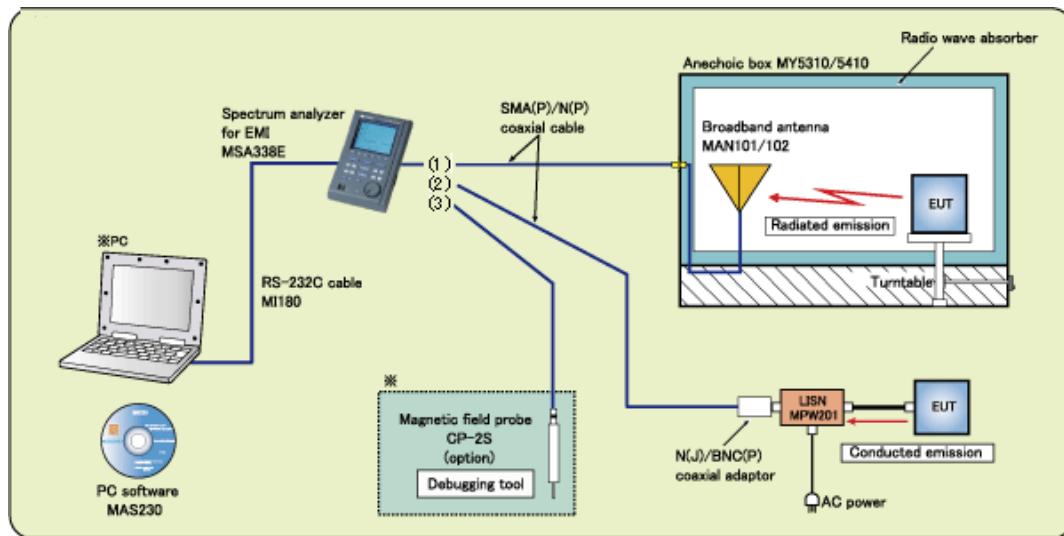


Fig.1 System configuration of MR2300

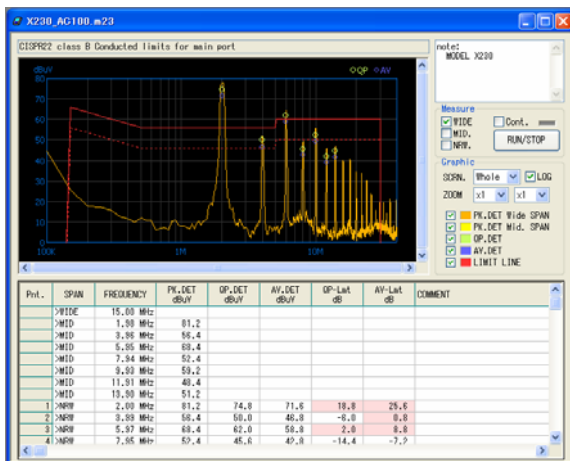


Fig.2 PC software MAS230

3-1 Installation of EUT into anechoic box

The installation requirement of EUT in the anechoic box MY5310 is shown in Fig.3. The noise in all directions radiated from EUT cannot be detected with the broadband antenna MAN101. The detection of the radiated noise of the component based on the following conditions becomes possible.

- ◇ The noise should be vertical and linear polarization component.
- ◇ The noise should be a component being radiated toward a broadband antenna from EUT.
- ◇ The noise should be a component being radiated from the upper position of the ground plate.

In short, only the noise being radiated from the circle mark in Fig.3 can be measured and evaluated.

The EUT as an example is put on the styrene foam that is non-conductive as shown in Photo 1 because the size is small and the position put is lower than the ground plate.

The position in which the radiated noise becomes maximum is found by rotating the knob for turntable by hand power.

In addition, regarding the horizontal polarization component, the measurement should be done by rotating EUT because the antenna cannot be moved.



Photo 1 Installation of EUT (keyless entry)

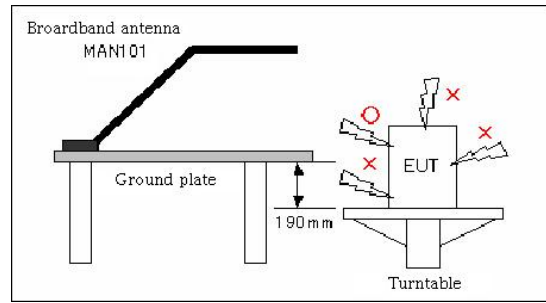


Fig.3 Installation requirement of EUT

3-2 Measurement by PC software

The EMI measurement can be easily done only by clicking RUN/STOP in the automatic measurement mode because the parameters recommended are set in Spectrum analyzer MSA338E and PC software MAS230 beforehand.

The frequency span is divided into three bands of Wide, Middle and Narrow for shortening the measurement time in this software.

- ◇ In the Wide span, the measurement is done with PK detection in the whole measuring frequency range and then the spectrums out of specification are searched.
- ◇ In the Middle span, only the above spectrums out of specification are measured with PK detection and the spectrums out of specification are searched as well.
- ◇ In the Narrow span, only the above spectrums out of specification are measured with QP or AV detection.

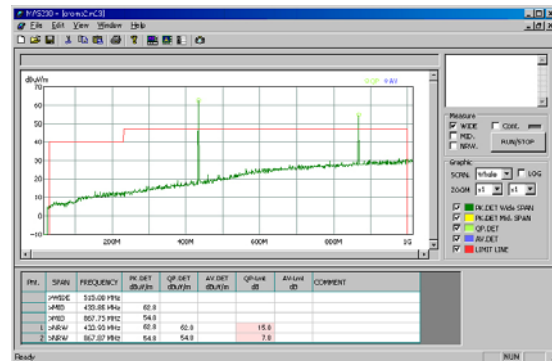


Fig.4 Example of measurement result of EUT

The measurement result of EUT is shown in Fig.4. The noise out of specification is displayed on the screen as the numeric data with the spectrum waveform.

The measurement result shown in Fig.4 is by the automatic measurement but PC software also has the manual measurement mode. This mode is very convenient for debugging EUT and removing the disturbance noise.

4. Comparison of MR2300 and formal test site

- (1) Each advantage and disadvantage of MR2300 and formal test site are shown in Table 1.
- (2) Comparison with data at anechoic chamber.

Table 1 Advantages and disadvantages of MR2300

	MR2300	Formal test site
Cost	The system price is very cheap. Moreover, the running cost can be saved because the problems can be solved before a formal test. The occupation area is also narrow.	In case of renting a formal test site, the rental fee is thousands dollars a day. In case of constructing an anechoic chamber, the huge construction cost of about one million dollars is necessary, and the big site is also necessary.
Efficiency	It is possible to proceed to the step of the problem's solution at once. Also released from the restriction of a place and time.	It is difficult to proceed to the step of the problem's solution at once because of making reservation, and long travel time is also necessary when the site exists far.
Performance	Not approved formally.	Approved formally.

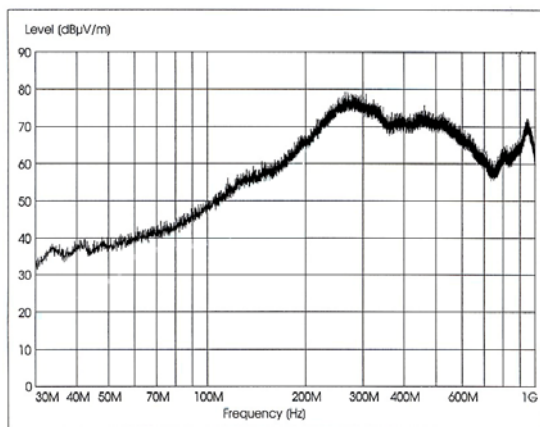


Fig.5 Measurement result by anechoic chamber

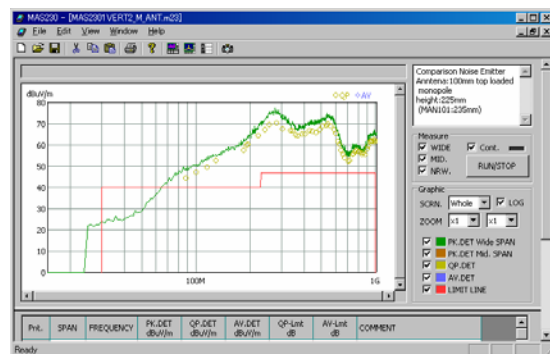


Fig.6 Measurement result by MR2300

Fig.5 and Fig.6 show the result of measuring the noise, which is radiated from CNE (Comparison Noise Emitter) widely used for the calibration of anechoic chamber, in the anechoic chamber and in the MR2300.

The measurement result in MR2300 was almost the same as in the anechoic chamber as judged from Fig.5 and Fig.6 although there is a physical restriction in MR2300 because broadband antenna, anechoic box, spectrum analyzer and PC software have been developed overall.

5. Conclusions

As explained in this paper, the EUT may pass the formal test by one time if the sufficient check is done by MR2300 system in advance. Moreover, even if the EUT fails in the formal test, the problem will be solved in a short time by using MR2300 and the result of the formal test. In conclusion, the development cost and time can be greatly reduced by using the EMI total test system MR2300 well as a debugging tool to solve the noise problem.