Magnetic Field Probe
MMP500
9kHz to 100MHz

Conducted disturbance noise measurement up to 9kHz low frequency -Precompliance-

Joint development with Tokyo Metropolitan Industrial Technology Research Institute
The LISN (Line Impedance Stabilization Network) is used for conducted disturbance noise test. However, the magnetic field probe MMP500 was born based on the desire to perform this test more easily or to identify the noise source. This conducted disturbance noise can be easily measured with MMP500 and signal analyzer MSA538E/MSA558E. MMP500 was completed through joint development with the Tokyo Metropolitan Industrial Technology Research Institute.

**Measurement of conducted disturbance noise**

The following is an example of measuring conducted disturbance noise of a power supply line as a DUT (Device Under Test). Measure placing the probe as perpendicular to the power supply line as possible, aligning the marker of the probe with the power supply line and making contact with the power supply line. It affects the rotation sensitivity and distance sensitivity described below. In this measurement example, the sheath's thickness of the power supply line affects the distance sensitivity. Assuming that the thickness of sheath is 0.5 mm, the disturbance noise is measured as 1dB lower because the distance sensitivity is 2dB/mm.

**Feature 1**

Using this measurement system, it is possible to measure the conducted disturbance noise of the power supply line without electrical contact and without using LISN. In addition, the disturbance noise on PCB can be measured without contact. Optimum for measuring power electronics equipment used in such as automotive industry.

**Feature 2**

Precompliance conducted disturbance noise measurement

If this system is used, the problem will be solved in the laboratory or outdoors. Save time and money.
- The signal analyzer MSA538E/558E can operate on battery (4 hours operating time), so no AC power supply is required.
- The format test may be performed once with the official test system (LISN) at the end.

**Feature 3**

The conducted disturbance noise can be measured by a simple system with only the magnetic field probe MMP500 and signal analyzer.

**Feature 4**

This probe can handle large current, DC current and AC current.

**Feature 5**

This measurement system has three detection modes of PosPK (positive peak), QP (quasi-peak) and AV (average).

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**Table:**

<table>
<thead>
<tr>
<th>Frequency (Hz)</th>
<th>Limit Value (dBuV)</th>
<th>RBW (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 to 52kHz</td>
<td>110 dBuV</td>
<td>30kHz(6dB)</td>
</tr>
<tr>
<td>50 to 150kHz</td>
<td>90 to 80 dBuV</td>
<td></td>
</tr>
<tr>
<td>150 to 500kHz</td>
<td>65 to 55 dBuV</td>
<td></td>
</tr>
<tr>
<td>0.5 to 5MHz</td>
<td>56 dBuV</td>
<td>9kHz(6dB)</td>
</tr>
<tr>
<td>5 to 30MHz</td>
<td>60 dBuV</td>
<td></td>
</tr>
<tr>
<td>30 to 100MHz</td>
<td>64 to 54 dBuV</td>
<td>120kHz(6dB)</td>
</tr>
</tbody>
</table>

The following is an example of the limit value. [Example of standard value]

- The limit line (red line) is not displayed on the screen.
How to use signal analyzer

1. Selection of measurement with MMP500

Select "Magnetic field measurement with MMP500" using MSAS538E/558E function keys.

- MEAS: Measuring function
- MFS: Magnetic field strength measurement
- PROBE: Probe selection
- CP-2S: 10MHz-3GHz magnetic field probe

![Diagram showing measurement setup]

If the limit line of the standard is close to the average noise level, set to a lower REF.

Specifications

- Frequency range: 9kHz to 100MHz
- Maximum measurement level: 117dBuV
- Analysis and display equipment: MSAS538E and MSAS558E
- Detection method: PspPK(Positive peak), Qp(Quasi-peak), AV(Average) detection
- Resolution bandwidth:
  - 300Hz(3dB) @ 9 to 150kHz
  - 9kHz(6dB) @ 10.15 to 30kHz
  - 12kHz(6dB) @ 30 to 100MHz
- QP detection time constant:
  - Time constant: 300Hz, 9kHz, 120kHz
  - Charge: 1ms
  - Discharge: 190ms, 50ms

**Note:** RBW = 300Hz, 3dB bandwidth and PspPK (positive peak) only

**Level calibration method**

The level is calibrated by the 50Ω microstrip line method. The level is measured aligning the marker of magnetic field probe with the 50Ω microstrip line and contacting with it.

- Level calibration points: 10 points (linear interpolation is performed at frequencies other than the calibration points)
- Two kinds of calibration coefficients

1. **Typical calibration coefficient**

   Typical values of calibration coefficient are installed in the signal analyzer MSAS538E/558E. Usually, the measurement can be done using this value (select "MMP500").

2. **Calibration coefficient attached to MMP500**

   Input the calibration coefficient attached to MMP500 from the PC using the command, and install it in "USER B" of MSAS538E/558E. When using this, select "USER B". More accurate measurements will be done.

The frequency characteristics of the MMP500 are calibrated in the signal analyzer MSAS538E/558E, so that the correct measurement values can be observed on the screen.

**Level calibration method**

- Level calibration method: 50Ω microstrip line method
- Rotation sensitivity: Deviation from 0° (marker position) within ±1dB @ 0 to ±30°
- Distance sensitivity: Attenuation by distance from strip line (detector surface reference, approx. 2dB/mm @ 1 to 3mm, approx. 7.3dB @ 4mm)
- Operating temperature: 0 to 50°C (guaranteed at 23 ± 10°C)
- Operating humidity: less than 40°C/80%RH (guaranteed at less than 33°C/70%RH)
- Storage temperature: -20 to 50°C
- Dimensions: 16.5x140mm (probe part) @excluding projections 10.5mm (detection portion) Total length: approx. 1.2m
- Weight: approx. 48g (including cable)
- Standard accessories: Storage case, Adapter MA306, Calibration coefficient data, Operating manual
- Options:
  - PC software MASS500
  - Logging software MASS10
  - PC software for EM MASS30
Software (option)

- **PC software MAS500**
  
  MAS500 is a software that controls the signal analyzer by the PC and displays the spectrum waveform on the PC screen. MMP500 or USER B can be selected in M/P Probe or Measuring function and the measurement results can be checked on the PC screen and saved.

- **Logging software MAS510**
  
  MAS510 is a logging software that collects the measurement data by unattended. It is optimum for watching an abnormal signal at night and recording the data by unattended for a long time.

- **PC software for EMI MAS530**
  
  MAS530 is a software used for conducted disturbance noise test. The frequency axis can also be displayed logarithmically. This is used in the Conducted EMI test system MR2150 described in Related Products.

Related products

- **Magnetic field probe CP-2SA**
  
  The magnetic field detection portion of CP-2SA is a shielded loop structure that adopts glass ceramic multi-layer board technology with excellent high frequency characteristics. The magnetic fields of the pattern and the terminal of device on a printed circuit board can be measured.

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>10MHz to 3GHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space resolution</td>
<td>approx.0.25mm (depending on objects)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>outside:120×135mm</td>
</tr>
<tr>
<td></td>
<td>probe:6mm(W)×1mm(T)</td>
</tr>
</tbody>
</table>

- **LISN (Line Impedance Stabilization network) MPW201B**
  
  When measuring the conducted disturbance noise discharged through the power supply line of EUT, the LISN is used to make constant the impedance of the power source observed from EUT side and to do measurement with reproducibility.

<table>
<thead>
<tr>
<th>Frequency range</th>
<th>150kHz to 30MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circuit type</td>
<td>50Ω/50μH and V type based on CISPR16-1</td>
</tr>
<tr>
<td>Rated current</td>
<td>15A</td>
</tr>
<tr>
<td>Power supply</td>
<td>Single phase, 50/60Hz, 250VACmax</td>
</tr>
<tr>
<td>Applicable models</td>
<td>MSA438E/538E/658E</td>
</tr>
</tbody>
</table>

- **Conducted EMI test system MR2150**
  
  MR2150 is a pre-compliance test system for conducted EMI. The development cost can be significantly reduced by debugging and evaluating EUT using this system before testing in the formal EMC site.

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