



\*Notebook is excluded

The features of EMC-100 contain two parts: one is the measurement instrument which is equipped with function of measuring electromagnetic interference (EMI), including conductivity of electromagnetic interference and radiated electromagnetic interference. It can provide products electromagnetic interference verification before an inspection. The other part is the training modules which allow students to implement the experiments easily and learn the basic concepts of electromagnetic interference and suppression countermeasure. Beginners are able to learn electromagnetic interference theories, measurement and suppression techniques as being an EMC engineer.

## ► Features

- The measurement instrument with built in a line impedance stabilization network and a spectrum analyzer provides products electromagnetic interference verification before a preliminary inspection.
- Measurement software used in EMC-100 is the same standard as the professional laboratory.
- Experimental modules are designed for learning electromagnetic interference and suppression countermeasure.
- The suppression components are developed by the experience integration of electromagnetic compatibility engineers. Users can easily learn how to use different suppression components to suppress electromagnetic interference. EMC-100 contains the measurement instrument ( EMC-11001) for providing the electromagnetic interference conductivity, and different experimental modules for supporting the various radiated experimental courses.

## ► Specifications

### ► EMI Measurement instrument (EMC-11001)

#### 1. Input / Output

- (1) Input voltage : AC 100V~240V (50Hz/60Hz)
- (2) Output voltage : AC 100V~240V (50Hz/60Hz)
- (3) Communication interface : USB

#### 2. Line impedance stabilization network (LISN)

- (1) Frequency range : 9KHz to 30MHz
- (2) Characteristic impedance:  $(50\mu\text{H}+5\Omega) // 50\Omega$
- (3) Phase : Single-phase
- (4) Rated current :  $2 \times 16\text{A}$
- (5) Maximum AC voltage : 250Vrms
- (6) Power frequency : DC-63Hz
- (7) With function of artificial simulative hand

#### 3. Spectrum analyzer

Frequency specifications

- (1) Frequency range : 9KHz~1GHz
- (2) Counter accuracy : 1Hz + timebase error
- (3) Frequency resolution :  $\leq 100\text{KHz}$
- (4) Bandwidth resolution : 10Hz ~1MHz

Amplitude specifications

- (1) Measurement range : +10dBm to Displayed Average Noise Level (DANL)
- (2) Noise level average display : -144 dBm/Hz at 1 GHz
- (3) Maximum DC voltage :  $\pm 0.2\text{VDC}$

#### Modulation analysis

- (1) Frequency range : 150KHz ~300MHz
- (2) Frequency modulation accuracy :  $\pm 1\%$  (typical)
- (3) Amplitude modulation accuracy :  $\pm 1\%$  (typical)
- (4) Operating temperature :  $0^\circ\text{C} \sim +70^\circ\text{C}$  (standard)

#### 4. Preamplicifier specifications

- (1) Frequency range : 500KHz ~ 1 GHz
- (2) Gain : 20 dB

### ► EMI Experiment module specifications

1. EMI-13001 Conducted Experiment
  - (1) Input voltage : AC 100V~240V (50Hz/60Hz)
  - (2) Producing conduction noise
  - (3) With filter suppression circuit
  - (4) With pluggable suppression components
2. EMI-14001 Radiated Power Supply
  - (1) Input voltage : AC 100V~240V (50Hz/60Hz)
  - (2) Output voltage : DC 12V
  - (3) Output current : 1A
3. EMI-14002 Radiated Case 1
  - (1) Input voltage : DC 12V
  - (2) Producing radiated harmonic noise
  - (3) With  $\pi$ -type filter suppression circuit
  - (4) With pluggable suppression components
  - (5) Circuit board wiring pattern : Horizontal wiring without laying copper
4. EMI-14003 Radiated Case 2
  - (1) Input voltage : DC 12V
  - (2) Producing radiated harmonic noise
  - (3) With  $\pi$ -type filter suppression circuit
  - (4) With pluggable suppression components
  - (5) Circuit board wiring pattern : Vertical orthogonal wiring without laying copper
5. EMI-14004 Radiated Case 3
  - (1) Input voltage : DC 12V
  - (2) Producing radiated harmonic noise
  - (3) With  $\pi$ -type filter suppression circuit
  - (4) With pluggable suppression components
  - (5) Circuit board wiring pattern : Shorted to ground with laying copper
6. EMI-14005 Radiated Case 4
  - (1) Input voltage : DC 12V
  - (2) Producing radiated harmonic noise
  - (3) With  $\pi$ -type filter suppression circuit
  - (4) With pluggable suppression components
  - (5) Circuit board wiring pattern : Simulate to two different substrates



## ▶ Experiment modules

- EMI-13001 Conducting experiment
- EMI-14001 Radiated power supply
- EMI-14002 Radiated Case 1
- EMI-14003 Radiated Case 2
- EMI-14004 Radiated Case 3
- EMI-14005 Radiated Case 4



## ▶ List of Experiments

- 1. The source of waveform for conductive electromagnetic interference**
  - 2-1 No Load conduction interference source.....EMC-13001
  - 2-2 Load conduction interference source .....EMC-13001
- 2. Power supply filtering experiment of conductive electromagnetic interference**
  - 3-1 LC Filter circuit.....EMC-13001
  - 3-2 First order filter circuit .....EMC-13001
  - 3-3 Second order filter circuit .....EMC-13001
- 3. Grounded experiment of conductive electromagnetic interference**
  - A. Filtering components without connecting to power ground experiment
    - 4-1 N-phase conduction measurement.....EMC-13001
    - 4-2 L-phase conduction measurement .....EMC-13001
    - 4-3 First order filter circuit .....EMC-13001
    - 4-4 Second order filter circuit .....EMC-13001
  - B. Secondary side and power grounded experiment
    - 4-5 N-phase conduction measurement of secondary side grounded experiment .....EMC-13001
    - 4-6 L-phase conduction measurement of secondary side grounded experiment .....EMC-13001
    - 4-7 First order filter circuit of secondary side grounded experiment .....EMC-13001
    - 4-8 Second order filter circuit of secondary side grounded experiment .....EMC-13001
- 4. Optimized experiment of conductive electromagnetic interference**
  - 5-1 Filter components choice and filter circuit combination .....EMC-13001
  - 5-2 First order filter circuit .....EMC-13001
  - 5-3 Typical first-order filter circuit .....EMC-13001
  - 5-4 Second order filter circuit .....EMC-13001
- 5. The source of waveform for radiated electromagnetic interference**
  - 6-1 Interference source experiment of searching for environment and measurement instrument
  - 6-2 Searching for radiated interference source using without laying copper and horizontal wiring circuit module .....EMC-14002
  - 6-3 Searching for radiated interference source using without laying copper and vertical wiring circuit module .....EMC-14003
  - 6-4 Searching for radiated interference source using with laying copper circuit module .....EMC-14004
  - 6-5 Searching for radiated interference source using circuit module of two different substrates simulation ....EMC-14005

## 6. Suppression components experiment of radiated electromagnetic interference

- 7-1 Radiated interference source measurement.....EMC-14002
- 7-2 Single component suppression .....EMC-14002
- 7-3 Combination components suppression .....EMC-14002
- 7-4  $\pi$ -type circuit suppression .....EMC-14002
- 7-5 Material selection experiment of suppression components .....EMC-14002
- 7-6 Ferrite ring and decoupling capacitors experiment .....EMC-14002

## 7. Radiated electromagnetic interference grounded experiment

- 8-1 Circuit to be measured without laying copper (EMC-14003) and ungrounded with laying copper (EMC-14004) of radiated interference source measurement
  - A. Ungrounded experiment with laying copper
    - 8-2 Single component suppression .....EMC-14004
    - 8-3 Combination components suppression .....EMC-14004
    - 8-4  $\pi$ -type circuit suppression .....EMC-14004
  - B. Grounded experiments of filter suppression components
    - 8-5 Ungrounded with laying copper and grounded with laying copper .....EMC-14004
    - 8-6 Grounded with laying copper and single component suppression .....EMC-14004
    - 8-7 Combination components suppression .....EMC-14004
    - 8-8 Grounded with laying copper and  $\pi$ -type circuit suppression .....EMC-14004

## 8. Shielding experiment of radiated electromagnetic interference

- A. Shielding experiment
  - 9-1 Shielding experiment without laying copper.....EMC-14003
  - 9-2 Shielding experiment with laying copper .....EMC-14004
- B. Shielding grounded experiment
  - 9-3 Shielding grounded experiment including components suppression .....EMC-14004

## 9. Optimized experiment of radiated electromagnetic interference

- 10-1 Single component suppression .....EMC-14005
- 10-2 Combination components suppression .....EMC-14005
- 10-3  $\pi$ -type circuit suppression .....EMC-14005
- 10-4 Grounded experiment .....EMC-14005
- 10-5 Shielding experiment .....EMC-14005

## ▶ System Requirements

- PC : CPU P4 2GHz or better  
 RAM 1GB or better  
 Two USB 2.0 version or better  
 Hard disk more than 10GB  
 DVD-ROM drive  
 OS : Win 7 with 32 bit or better

## ▶ Accessories (EMC-19001)

1. Grounding braid x 1
2. Suppression components x 1 set
3. Storage cabinet x 1

## ▶ Consumable materials

1. Conductive foam
2. Aluminum Foil tape

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