# Effects of a noisy environment on measured values (IM7580 series)

## Introduction

Customers make measurements in a variety of environments, and measurement circuits may be contaminated by noise. The Impedance Analyzer IM7580 series is designed to provide stable measured values even in noisy environments. This technical article evaluates variability in measured values caused when noise is introduced to power supply and measurement lines to show how the addition of such noise does not cause measured values to change.

## 1. Method used to introduce noise

Table 1 provides a list of equipment used. An interval noise tester from Noise Laboratory Co., Ltd., was used to add noise to power supply and measurement lines.

Figure 1 illustrates the method by which noise was introduced to the power lines. A voltage pulse generated using a noise simulator was input to the AC power lines at an interval of 55 Hz (18 ms). Table 2 lists the measurement conditions.

Figure 2 illustrates the method by which noise was introduced to the measurement lines. The three or four coaxial cables used to connect the test head and measuring instrument were clamped together with a coupling adapter, and a voltage pulse was input at an interval of 55 Hz, as with the power lines. The measurement conditions, which were the same as those used when adding noise to the power lines, are listed in Table 2.

Table1. Equipment used

| Device | Model number | Manufacturer |
|---|---|---|
| Control and Pulse Generation Unit | INS-400AX | Noise Laboratory Co., Ltd. |
| Filter and Superposition Unit | INS-IJ-02 | Noise Laboratory Co., Ltd. |
| Coupling Adapter | CA-805B | Noise Laboratory Co., Ltd. |
| Coupling Adapter | IM7581 | HIOKI |
| Coupling Adapter | IM7587 | HIOKI |

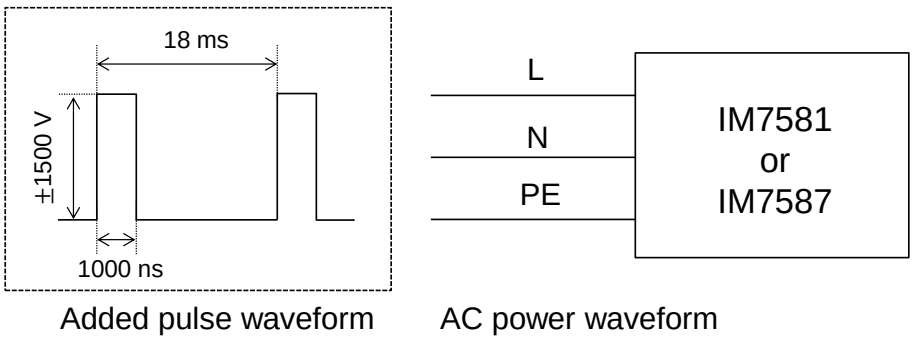


Figure 1. Addition of noise to the power lines

Table 2. Measurement conditions

| Measurement conditions | |
|---|---|
| Frequency | 300 MHz, 1000 MHz |
| (IM7581: 300 MHz only) | |
| DUT | 10 pF (7 mm connector) |
| Mode | SLOW2 |
| Power | +1 dBm |
| Number of measurements | 750 |

*1: 3CV = 3 × standard deviation / average value

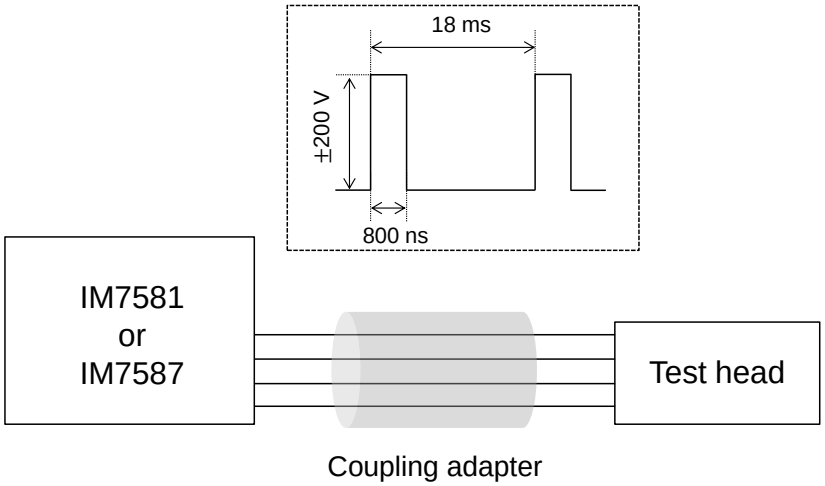


Figure 2. Addition to noise to the measurement lines

## 2. Results of noise introduction test

Table 3 lists the evaluation results. The values in the table were calculated as the 3CV values for the impedance under the indicated measurement conditions. No increase in variability was observed in response to the addition of noise, regardless of the instrument used or the measurement frequency. Figure 3 illustrates the variability in impedance values for the cells highlighted in pink in Table 3. This graph also illustrates that the introduction of noise resulted in no change in measured values.

Table 3. Evaluation results (3CV values for impedance under each set of measurement conditions)

| | | Instrument used and measurement frequency | | |
|---|---|---|---|---|
| | | IM7581 | | IM7587 |
| | | 300MHz | 300MHz | 1000MHz |
| Noise added to power lines | No noise | 0.0025% | 0.0026% | 0.0040% |
| | +1500 V | 0.0026% | 0.0027% | 0.0040% |
| | -1500 V | 0.0027% | 0.0026% | 0.0038% |
| Noise added to measurement lines | No noise | 0.0026% | 0.0027% | 0.0038% |
| | +200 V | 0.0028% | 0.0028% | 0.0038% |
| | -200 V | 0.0029% | 0.0027% | 0.0038% |

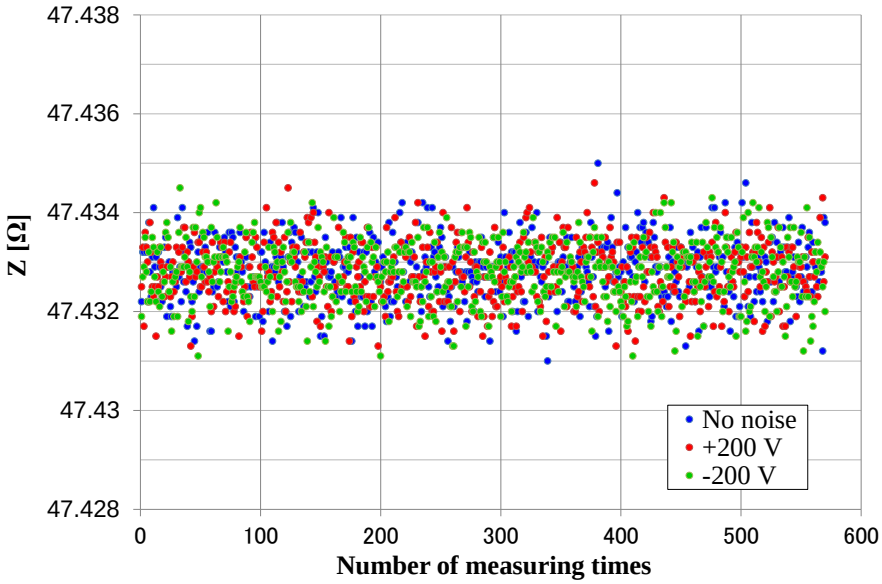


Figure 3. Variability in impedance Z (IM7587, 1000 MHz, with noise added to measurement lines)

## 3. Conclusion

This technical article has verified the noise performance of the IM7580 series. The tests it describes show that superposing a noise component onto the power lines or measurement lines under the indicated measurement conditions caused no change in measured values. The IM7580 series is capable of stable measurement, even in a noisy environment such as the one simulated here.