

Keithley2002 and HP3458A DMM Performance Evaluation

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Comparison of Keithley2002 and HP3458A DMM

1.Specification

| | | Keithley2002 | HP3458A | Winner |
|-----------------------|------------------------------------|-------------------|-------------------------|--------------|
| Price | | | | Keithley2002 |
| Size | | 90 × 214 × 369 mm | 88.9 × 425.5 × 502.9 mm | Keithley2002 |
| Weight | | 4.2Kg | 12Kg | Keithley2002 |
| Operating Temperature | | 0°C to 50°C | 0°C to 55°C | HP3458A |
| Consumption | | < 55VA | < 80VA | Keithley2002 |
| Digital resolution | | 8.5 digits | 8.5 digits | Same |
| DC Volts | Ranges | 5, 0.2V to 1000V | 5, 0.1V to 1000V | Same |
| | Resolution | > 2nV | > 1nV | HP3458A |
| | Accuracy (24hours) | > 1.3ppm | > 0.6ppm | HP3458A |
| | Voltage Reference Stability (year) | >10ppm | >8ppm | HP3458A |
| AC Volts | Ranges | 5, 0.2V to 750V | 6, 0.01V to 1000V | HP3458A |
| | Bandwidth | 20Hz to 2MHz | 1Hz to 10MHz | HP3458A |
| | Accuracy (24hours) | > 300ppm | > 100ppm | HP3458A |
| DC Current | Ranges | 5, 200uA to 2A | 8, 100nA to 1A | HP3458A |
| | Sensitivity | > 10pA | > 1pA | HP3458A |
| | Accuracy (24hours) | > 55ppm | > 14ppm | HP3458A |
| AC Current | Ranges | 5, 200uA to 2A | 5, 100uA to 1A | Keithley2002 |
| | Bandwidth | 20Hz to 100kHz | 10Hz to 100kHz | HP3458A |
| | Accuracy (24hours) | > 1600ppm | > 500ppm | HP3458A |
| Ohms | Ranges | 9, 20Ω to 1G Ω | 9, 10Ω to 1G Ω | Same |
| | Sensitivity | > 20u Ω | > 10u Ω | HP3458A |
| | Accuracy (24hours) | > 2.8ppm | > 2.2ppm | HP3458A |
| Frequency | Voltage Range | 1Hz to 15MHz | 1Hz to 10MHz | Keithley2002 |
| | Current Range | 1Hz to 1MHz | 1Hz to 10MHz | HP3458A |
| | Accuracy | 300ppm | 100ppm | HP3458A |
| Temperature | | Build-in | N/A | Keithley2002 |

From above specifications, HP3458A is better than Keithley2002 in resolution, accuracy and stability, and Keithley2002 is better than HP3458A in size, weight and cost. So for bench test application HP3458A is the primary choice and for field test Keithley2002 should be better.

2. DC voltage meter test

Test set is shown in Fig. 1.

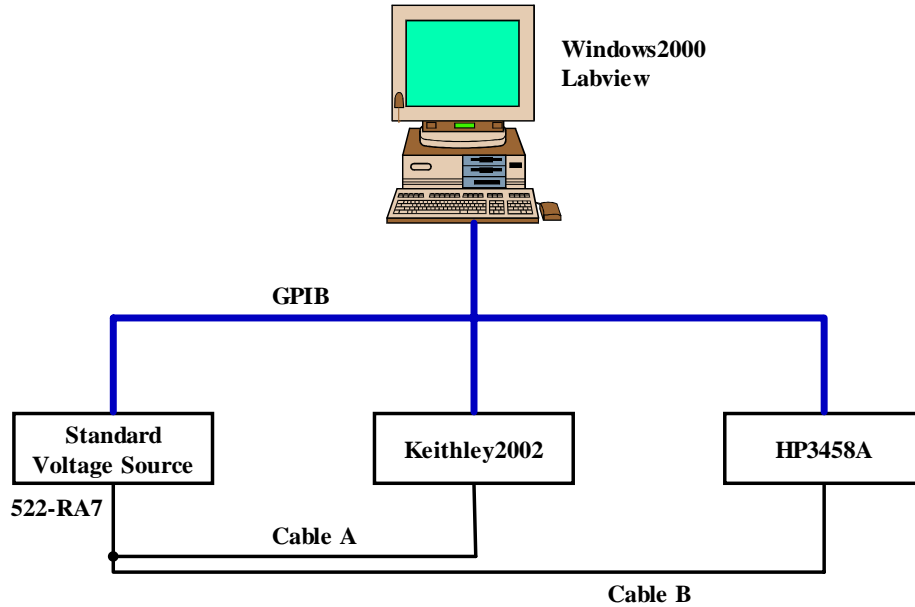


Fig. 1 DMM test setup

Data acquisition PC sets voltage source output value and gets Keithley2002 and HP3458A readback data at the same time via GPIB bus.

Since DMMs under test are 8.5 digits high sensitive instruments, the difference between cable A and cable B should be considered. In order to figure out this difference we set voltage source output to 0 volt and compared two test data under different cable connections: one is Keithley2002 connected via cable A and HP3458A connected via cable B; the other is HP3458A connected via cable A and Keithley2002 connected via cable B. The result is shown in Fig.2.

From this test we can find that the difference of cables just provide an offset but does not change readback distribution. So in our distribution test we can ignore the difference of cables.

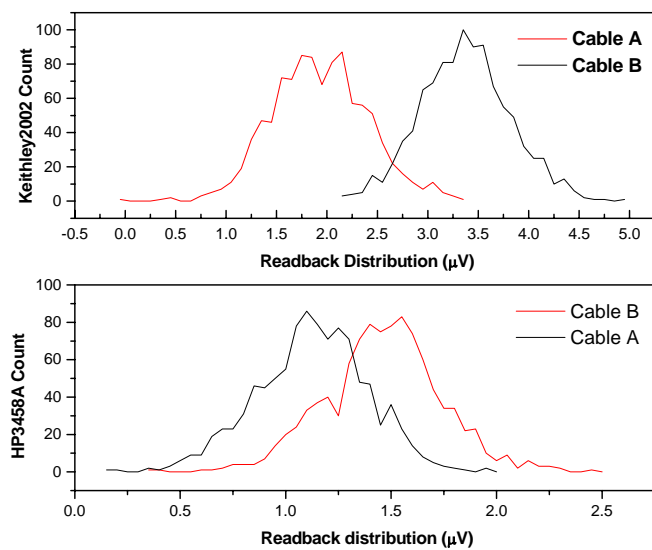


Fig. 2 Readback distributions under different connections

Fig. 3 ~ 7 display the distribution test results.

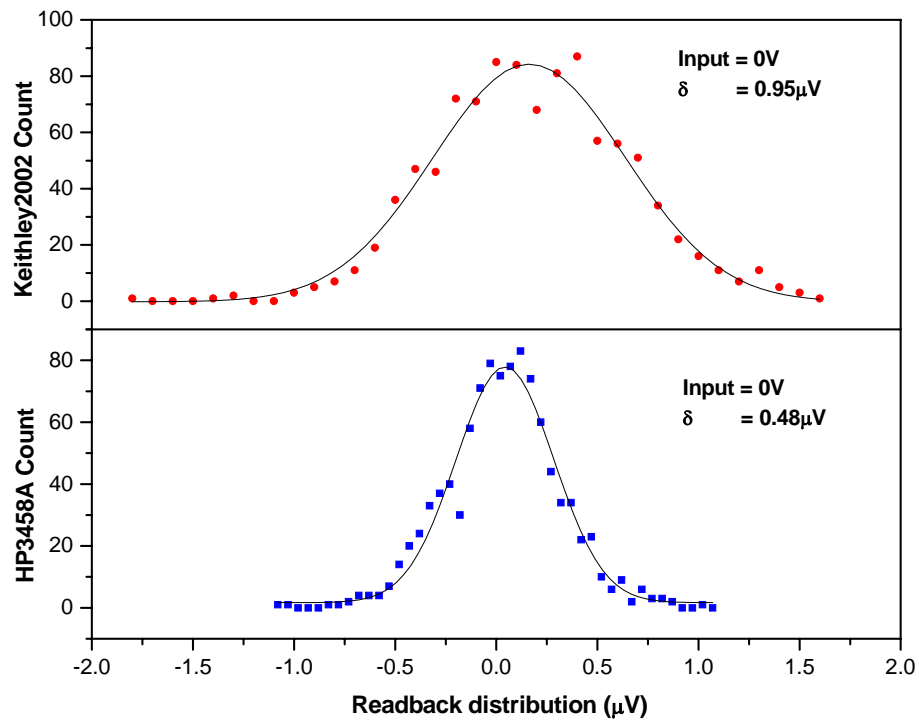


Fig. 3 Input = 0V

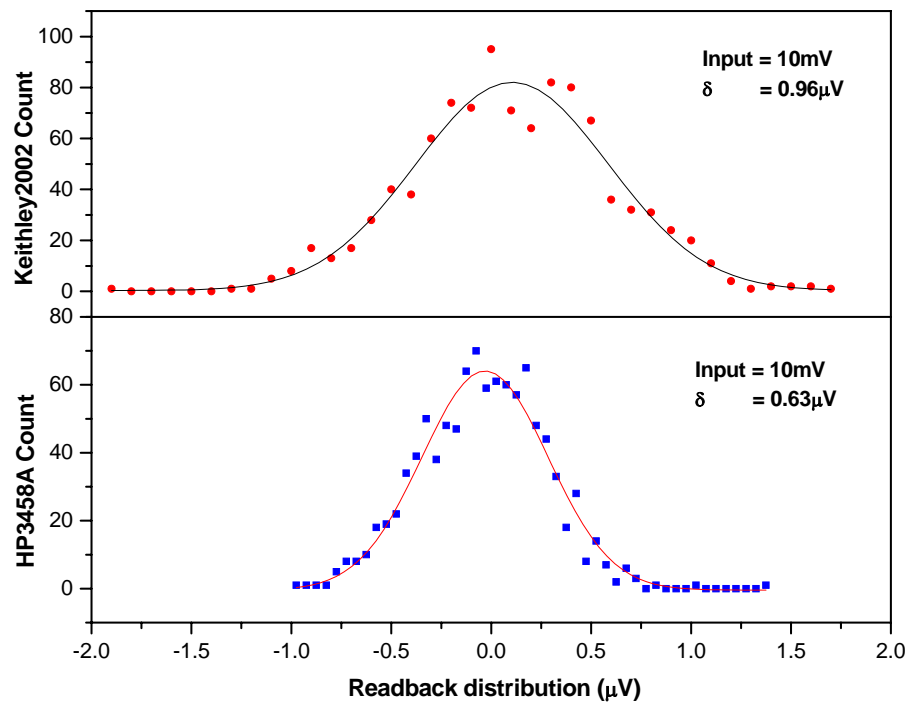


Fig. 4 Input = 10mV

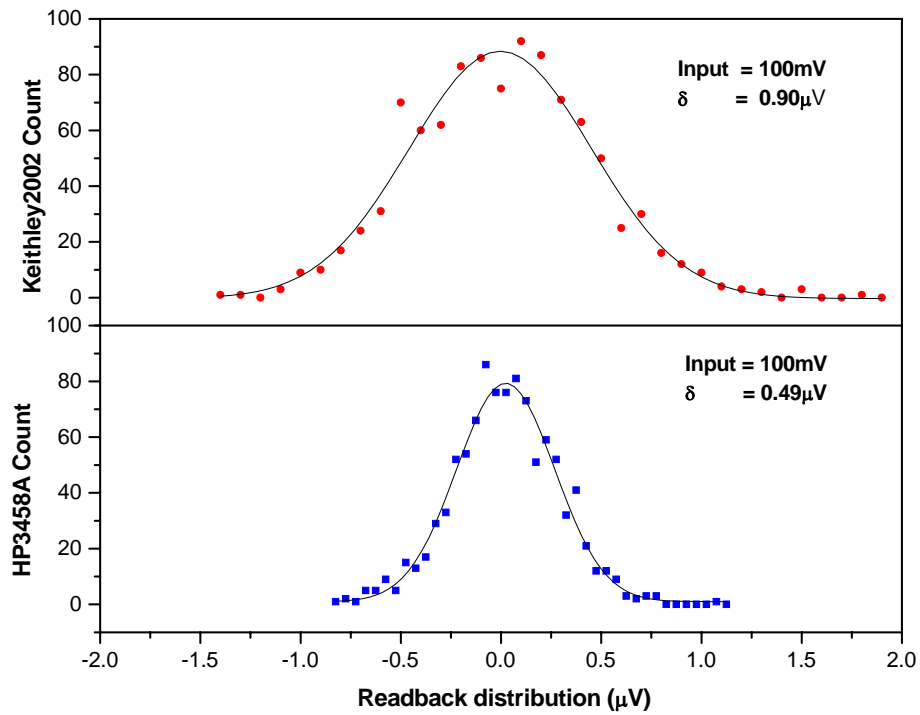


Fig. 5 Input = 100mV

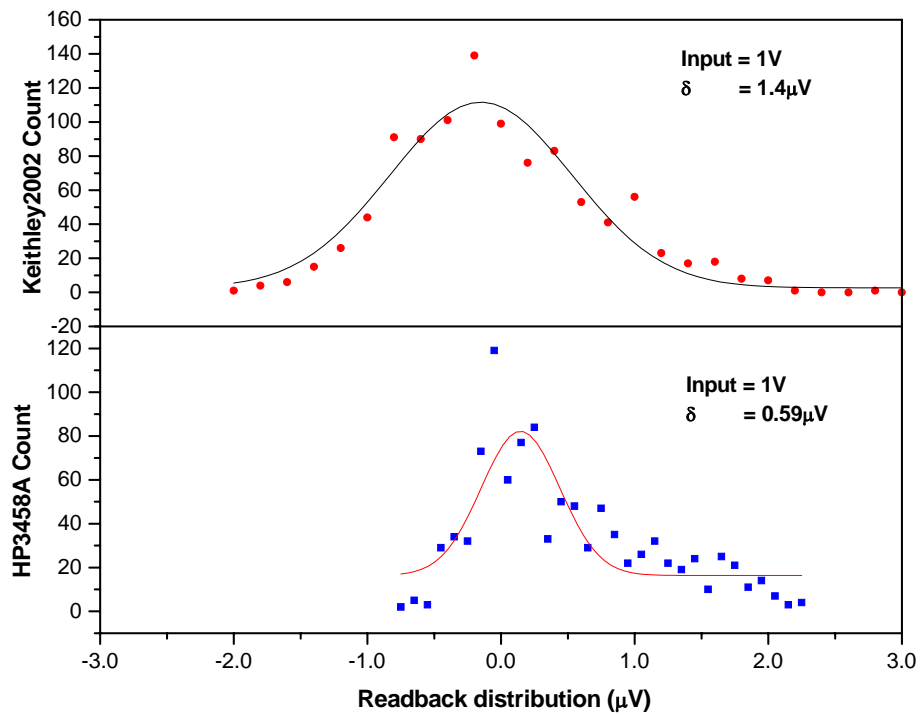


Fig. 6 Input = 1V

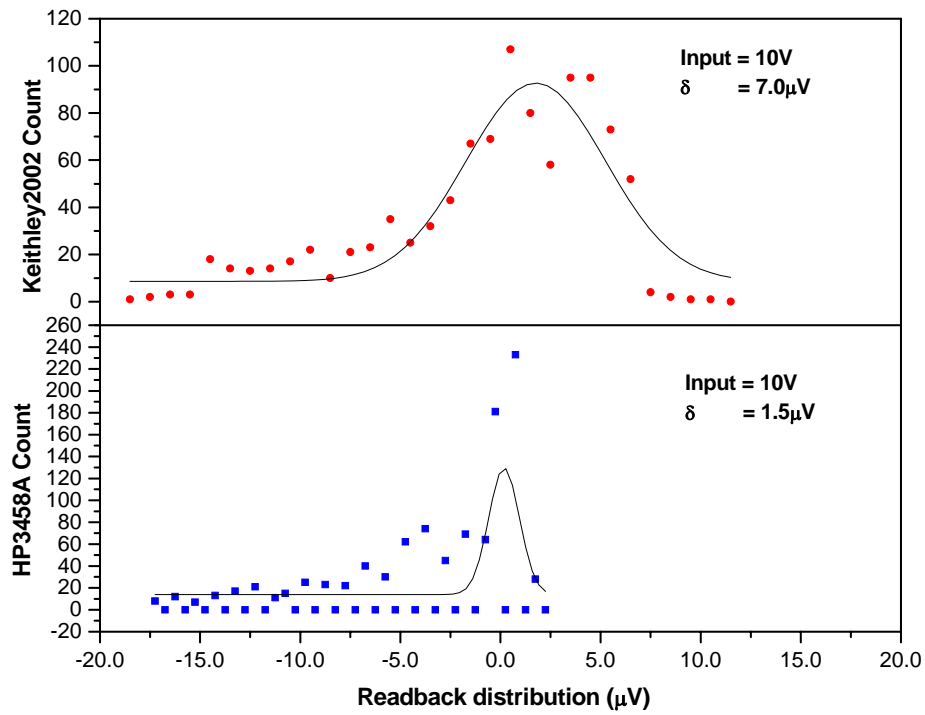


Fig. 7 Input = 10V

From above test results HP3458A is better than Keithley2002 running in DCV mode. It fits for their specifications.