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# Development of the Low Noise Front-end Electronics for Pulse Voltage Stability Measurement

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To meet the measurement requirements for the pulse-to-pulse stability of high-voltage output pulses from solid-state pulse modulators, this paper designs a low-noise front-end electronics "SAFee", which can provide a DC bias of -10 V to 10 V. The offset of the divided voltage pulse is adjusted to near 0 V and then measured with an oscilloscope at a resolution of 1 mV/div, thereby achieving a stability measurement of 50 ppm for voltage pulses up to 10 V. The core part of SAFee is a discrete three-op amp instrumentation amplifier. Its CMRR, output noise and other key parameters have been calculated in detail, and the optimal amplifier LT6018 and precision matching resistor network LT5401 form ADI has been selected. The DC bias circuit is generated by the precision reference voltage LTC6655, 20-bit DAC AD5791 and ultra-precision operational amplifier AD8676. The system is controlled by a module based on Xilinx ZYNQ7010. The test results show that the output noise of SAFee is 150.34 $\pm$ 1.13 µV RMS, which can meet the measurement requirements of solid-state pulse modulators with a stability of 50 ppm. In addition, the output voltage and DAC code are scaled, and the goodness of fit R2 can reach more than 0.99999998.

#### Minioral

Yes

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No

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Yes

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