A CMOS INTEGRATING AMPLIFIER FOR THE PHENIX RING IMAGING CHERENKOV DETECTOR

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A CMOS integrating amplifier has been developed for use in the PHENIX Ring Imaging Cherenkov (RICH) detector. The amplifier, consisting of a charge-integrating amplifier followed by a variable gain amplifier (VGA), is an element of a photon measurement system comprising a photomultiplier tube, a wideband, gain-of-10 amplifier, the integrating amplifier, and an analog memory followed by an ADC and double correlated sampling implemented in software. The integrating amplifier is designed for a nominal full scale input of 160 pC with a gain of 20 mV/pC and a dynamic range of 1000:1. The VGA is used for equalizing gains prior to forming analog sums for trigger purposes. The gain of the VGA is variable over a 3:1 range using a 5-bit digital control, and the risetime is held to approximately 20 ns using switched compensation in the VGA. Details of the design and results from several prototype devices fabricated in 1.2 μm Orbit CMOS are presented. A complete noise analysis of the integrating amplifier and the correlated sampling process is included as well as a comparison of calculated, simulated and measured results.

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