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Development of a general-purpose preamplifier for silicon sensors with high frequency compatibility and noise reduction for high energy nuclear experiments (poster-ID71)

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A HGCROC1 is an integrated circuit with low noise and wide dynamic range readout for the real detectors to be installed in the experiments.

However, during the R&D phases of silicon detectors, we usually just need a much simpler preamplifier to evaluate a silicon sensor. In this case a sophisticated preamplifier system, like HGCROC is not needed.

Therefore, we developed a highly versatile readout circuit that can be used with a simple setup in a test beam and a laboratory. We focused on the frequency band, noise reduction, and adjusting the impedance matching for silicon pad sensor. The fabricated circuit consists of three main circuit blocks: charge sensitive amplifier, primary shaper, and inverting amplifier.

The output of the circuit was confirmed in the case of an LED with high light intensity.

In this poster, we will summarize the current status and results of our custom-made preamplifier tuned for a silicon pad sensor with 320 um thickness ,and discuss a future plan.

1 ASIC chip is plant to be used for data readout of CMS HGCAL and the FoCal-E pad detector in ALICE.

1 Thienpont, Damien; de la Taille, C, "Performance study of HGCROC-v2: the front-end electronics for the CMS High Granularity Calorimeter", JINST 15 (2020) C04055

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Author: YODA, Koshiro (University of Tsukuba (JP))

Co-authors: CHUJO, Tatsuya (University of Tsukuba (JP)); INABA, Motoi (University of Tsukuba (JP)); SAKAI, Shingo (University of Tsukuba (JP)); INUKAI, Taichi (University of Tsukuba (JP)); ITO, Subaru (University of Tsukuba (JP))

Presenter: YODA, Koshiro (University of Tsukuba (JP))

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