The PADI ASIC for Time of Flight Measurements

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In this paper we recommend the PADI (preamplifier-discriminator) ASIC for future time of flight (ToF) measurements in space experiments.
We present our first trials in ToF measurements, the FEE1 and FEE5 PCB's developed for the upgrade of ToF measurements at FOPI detector (GSI-Darmstadt). We obtained an excellent time resolution (at ~ ps level) but the power consumption was 1.5 W/Ch (for FEE1) and 0.5 W/Ch (for FEE5), totally unsatisfactory for large channel number applications. We decided to design a specialized ASIC and present the main stages of the PADI ASIC development (present power consumption ~ 17mW/Ch).
PADI has been developed for large physics experiments: the future FAIR ensemble (at GSI-Darmstadt, Germany) will host the CBM experiment, where the ToF will be measured with Resistive Plates Chambers in approximately 150,000 simultaneous channels.
We present also the results of PADI when connected to several other detectors.
Following this development chain, PADI is now a mature product, tested in various configurations, and ready for use also in space experiments.