FAKULTA ELEKTROTECHNICKÁ
ZÁPADOČESKÉ UNIVERZITY
V PLZNI

Funkční vzorek

Radiation resistant readout system for TPX3 detector networks

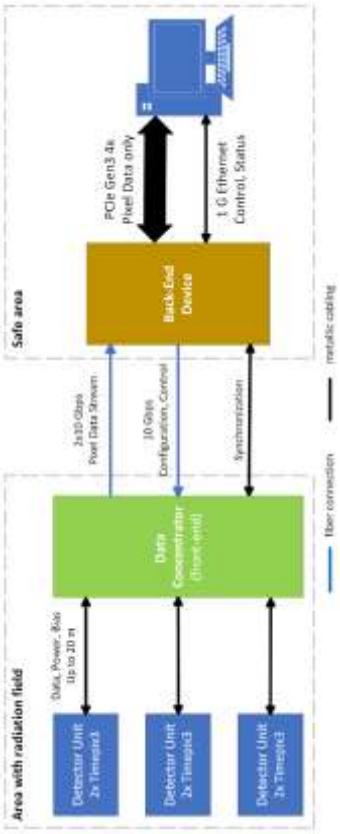

Figure 1: Concept of measurement chain

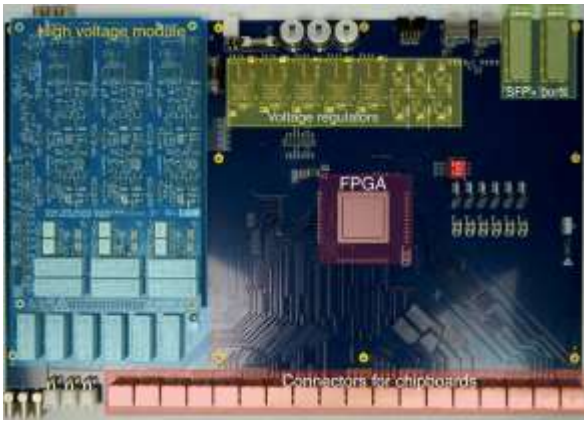

Figure 2: Front-end part of readout system

- V souladu s platnou metodikou Úřadu vlády ČR je uplatňován funkční vzorek.
- This result was funded by Technology Agency of the Czech Republic, grant number TN02000012.
- **Description:**

  The result represents a readout/acquisition system capable of controlling up to six Timepix3 detectors in harsh environments, including radiation and magnetic fields. These conditions are typical of large scientific setups, such as accelerators or the nuclear industry. The measurement chain consists of two devices: the front-end and the back-end. The front-end is connected to the detector units (Timepix3 chipboards) via metallic cables. It is responsible for collecting data from all detectors and producing a unified data stream. This stream is transmitted to the back-end of the readout system via optical fibers. The design ensures that only the detectors and their power supplies are placed in areas with strong radiation fields, while the front-end can be positioned up to 20 meters away.

  The front-end is implemented using a flash-based FPGA, making it resistant to higher radiation levels (units of Gray per campaign was tested). The back-end is based on a fully commercial design and is intended to be located in a safe area.

- **Key features:**
  - Up to six Timepix3 detectors in one segment
  - Up to 240 MHit/s
  - PCIe Gen3 4x Interface
  - Long distance between front-end and back-end (based on fiber)

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