Characterization of the Strip Front-End ASIC of the PANDA MVD with the JDRS
PANDA Experiment

- Cooled $\bar{p}$ beam @HESR
  - $1.5 \text{ GeV/c} < p < 15 \text{ GeV/c}$
  - $\Delta p/p < 10^{-4}$

- Study strong interaction
  - Multi-$s$ and $c$ hadron spectroscopy
  - Exotic states
  - Nucleon structure
  - $\bar{p}A$ collisions
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Versatile data acquisition system for the different front-end prototypes

- Spatial resolution < 100 μm
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Jülich Digital Readout System

- Spatial resolution $< 100 \mu m$
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PASTA and JDRS

PASTA
- Time-over-threshold: time + charge measurement
  - low threshold: leading edge time stamp
  - high threshold: deposited charge

Self trigger capability

<p>| | |</p>
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- Former version of JDRS (ToPix)
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More than 1000 parameters to tune

Automatic routines
Evaluation of the Performance of PASTA

- Internal injection
  - Channel response

![Channel Response for Analog Injection (20 fC)](image)

reduced $\varepsilon$ in 10% of ch
Evaluation of the Performance of PASTA

- Internal injection
  - Channel response
  - Threshold calibration
    - differential scheme ($\text{th}_+ - \text{th}_- \geq 0$)
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- Internal injection
  - Channel response
  - Threshold calibration
    - differential scheme \((\text{th}_+ - \text{th}_- \geq 0)\)
  - Linearity of the front-end

![ToT Distribution VS Pulse Amplitude](image)

Single channel

<table>
<thead>
<tr>
<th>Entries</th>
<th>59</th>
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<tr>
<td>(\mu)</td>
<td>0.637 ± 0.078</td>
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<tr>
<td>P1</td>
<td>25.27 ± 0.03</td>
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Good linearity
Residuals within detector resolution

![Channel Response for Analog Injection (20 fC)](image)

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Evaluation of the Performance of PASTA

- Internal injection
  - Channel response
  - Threshold calibration
    - differential scheme ($\text{th}_+ - \text{th}_- \geq 0$)
- Linearity of the front-end
- Proton beam
Evaluation of the Performance of PASTA

- Internal injection
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  - Frequency-dependent response

![Channel Response](image1)

![ToT Distribution VS Pulse Amplitude](image2)

![Single channel](image3)
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**Channel Response**

Non-flat \(\varepsilon\) across the channels → threshold effects

**ToT Distribution VS Pulse Amplitude**

- Good linearity
- Residuals within detector resolution

---

**Ch Response to Global Threshold**

- Channel number
- Entries 5593276

- Channel Response for Analog Injection (20 FC)
- Channel Response to Global Threshold (5 FC)
- Ch Response to Global Threshold (2 FC)

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**Reduced \(\varepsilon\) in 10% of ch**

- Single channel
- Non-flat \(\varepsilon\) across the channels
Evaluation of the Performance of PASTA

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Channel Response

Similar patterns per ch
\(\varepsilon\) reduced @50 MHz

ToT Distribution VS Pulse Amplitude

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\[ \varepsilon \text{ reduced above 80 MHz} \]

\[ \text{Entries} \quad 5593276 \]
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- **Proton beam**
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- **Data acquisition system**
  - Modular integration of PASTA in the JDRS
  - User-friendly GUI
  - Stable operation (incl. in-beam)

- **PASTA**
  - Principle of operation verified
  - Operation of individual channel
  - Critical optimization of global settings
  - Frequency-related issues
  - Significant input for PASTA 2.0