Barrel DIRC TDR Status

PANDA Collaboration Meeting
Bochum February-Mars 2016

Georg Schepers

Outline TDR
since January 2016

- BaBar-like design works for PANDA

- Key component improvements lead to **Baseline design**
  - 3 wide bars (53 mm)
  - Synthetic fused silica prism (shape under study)
  - Lens with two curved surfaces
  - Highly segmented photon sensors
    - **Array of 3x3+2 MCP-PMTs**
  - Fast photon read out

- Plate design as **option** with time-based reconstruction

New structure

Content

1. Preface
2. Executive Summary
3. The PANDA Experiment and its PID Concept
4. Barrel DIRC Design
5. Simulation and Reconstruction (Methods)
6. Components
7. Performance validation (Results MC, test beam, bench mark channel)
8. Mechanics and Integration
9. Project Management

Barrel DIRC Design

- DIRC performance proven in BaBar, Belle
- PANDA base line design (3 wide bars)
- design choices & their motivation
  - Radiator geometry: wide Bar, plate
  - Expansion Volume: oil tank, quartz
  - Focusing Optic: matching photo sensor pixel size
- Cost optimized design option (plate)

Simulation and Reconstruction - Roman

- Simulation (input to MC, output: Light yield, Occupancy maps)
  - Content in short already the DIRC2015 paper

- Geometrical Reconstruction (Cherenkov angle resolution, PID)
  - Content in short already the DIRC2015 paper

- Time based imaging Reconstruction (PDF,...)
  - As option for the plate design (and for the 3 bar design)
  - Theoretical Content in short already the DIRC2015 paper

- Influence of radiation length to EMC

- Radiation Map in preparation

Components

- Radiators - Marvin
  - New setup and measurements reflectivity in prep.
  - Measurement parallelism in prep. (Georg)
  - List of Manifacturers, separated production methods (Georg)
- Radiation Hardness – Matthias
  - Addition of measurements of material from Nikon (Erik)
- Focussing - Carsten
  - Some Content in short already the DIRC2015 paper
- Photo sensors

- FEE & DAQ
  - Text to be reviewed

Performance validation (PID, Mis-ID)

Results from

- MC - Roman
  - DIRC 2015 paper to be extended
- Test-beams (Prototyping, Tests and Qualification) - Roman
  - DIRC 2015 paper to be extended

- Physics Analysis (of a Benchmark Channel) - Klaus G.

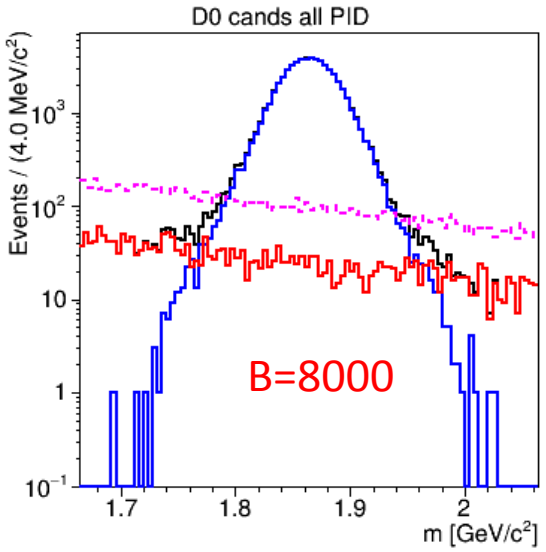
Physics QA Barrel DIRC

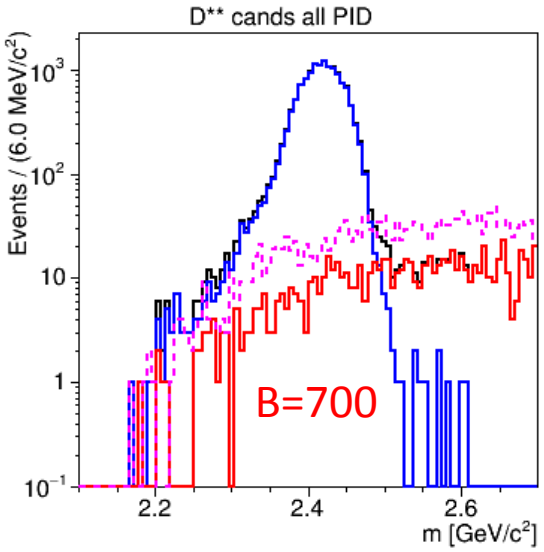
Example:

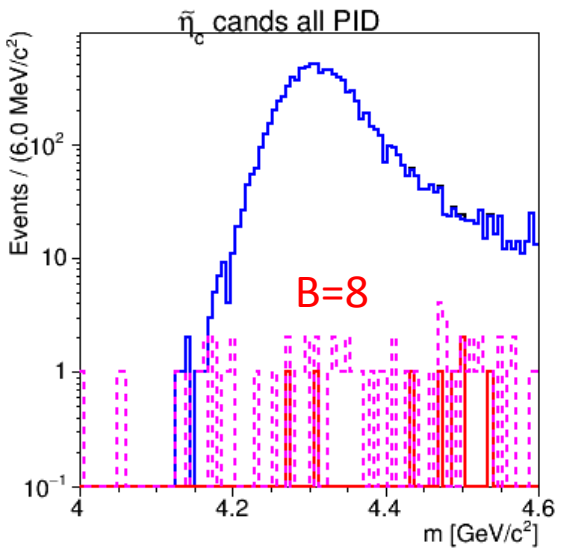
- Decay channel idea: Charmonium hybrid

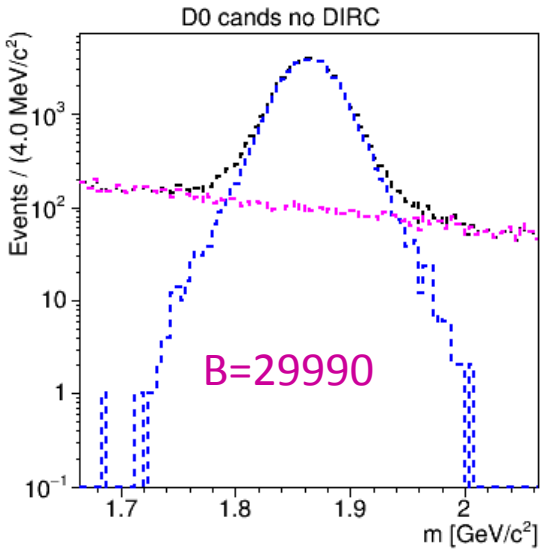
$$\bar{p}p \rightarrow \tilde{\eta}_{c1}\pi^+\pi^-$$
$$\hookrightarrow D^0\bar{D}^0(2420)$$
$$\hookrightarrow \bar{D}^0\pi^+\pi^-$$
$$\hookrightarrow K^+\pi^-$$
$$\hookrightarrow K^-\pi^+$$

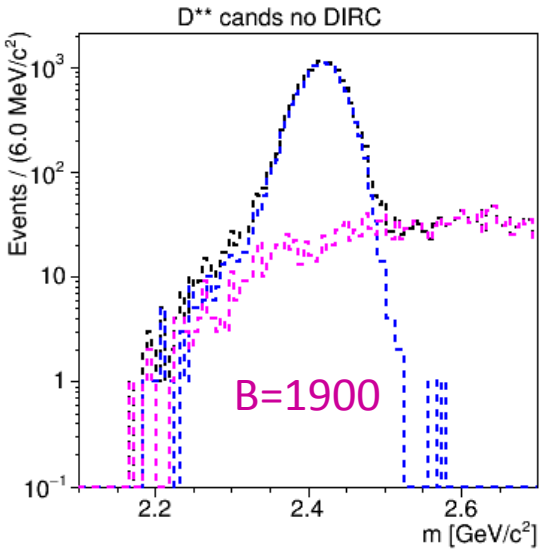
Reco Plots

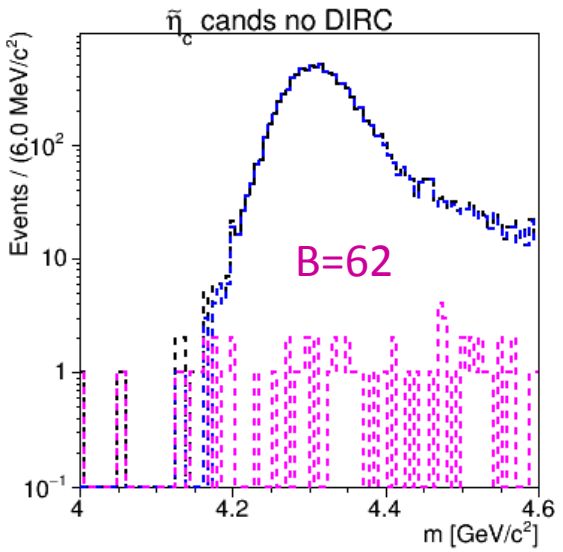

D0 cands all PID
Events / (4.0 MeV/c²)
B=8000
m [GeV/c²]


D** cands all PID
Events / (6.0 MeV/c²)
B=700
m [GeV/c²]

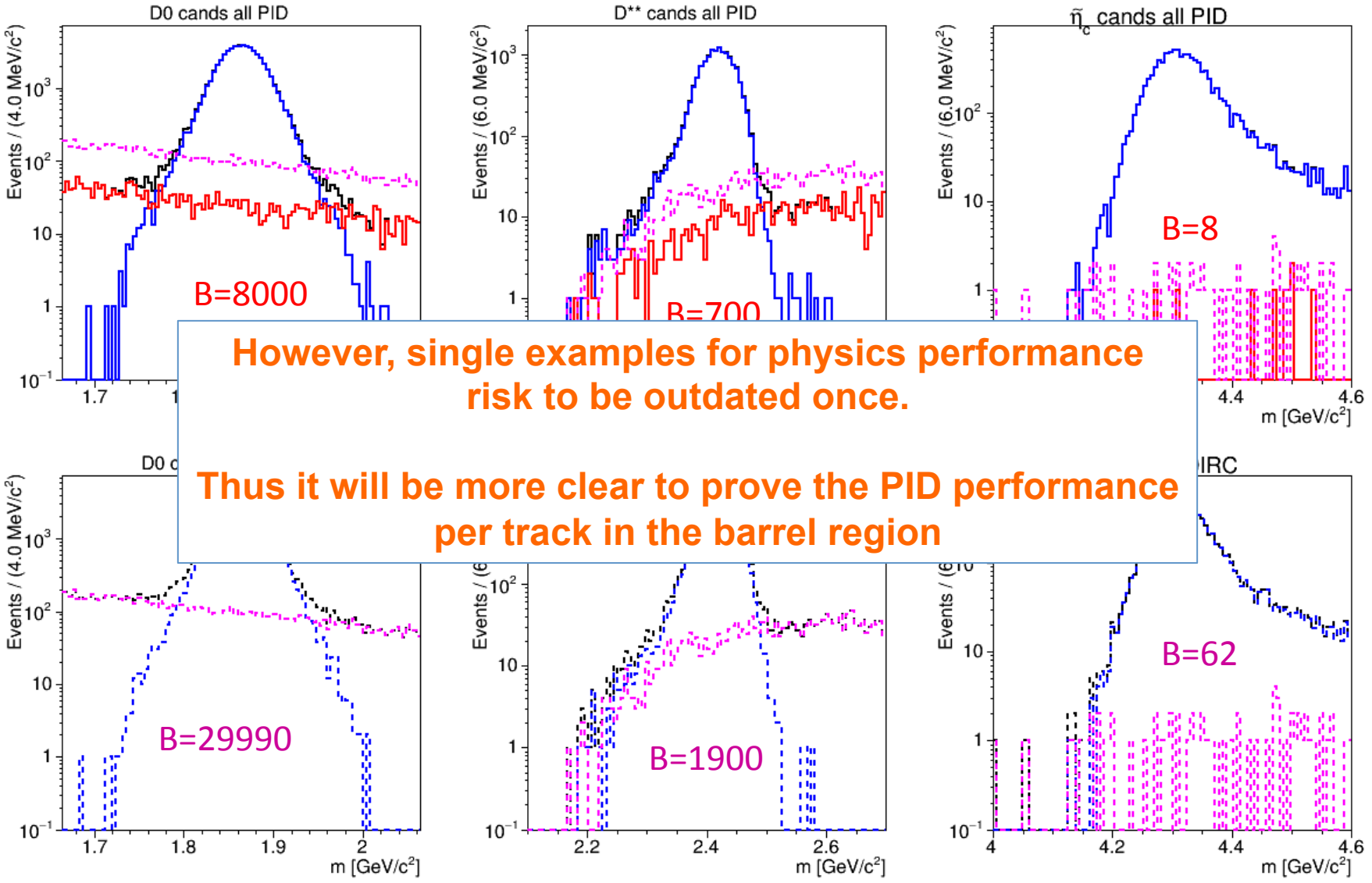

η̃c cands all PID
Events / (6.0 MeV/c²)
B=8
m [GeV/c²]


D0 cands no DIRC
Events / (4.0 MeV/c²)
B=29990
m [GeV/c²]


D** cands no DIRC
Events / (6.0 MeV/c²)
B=1900
m [GeV/c²]


η̃c cands no DIRC
Events / (6.0 MeV/c²)
B=62
m [GeV/c²]

Reco Plots



However, single examples for physics performance risk to be outdated once.

Thus it will be more clear to prove the PID performance per track in the barrel region

Mechanics and Integration

- Mechanics structure (detector components, services)
  - Drawings Andreas und Doro, in preparation

- Integration into TS (installation mechanics, alignment)

Project Management

Organization

Time schedule - Jochen

Cost table (baseline design, plate design) - Jochen

TIME LINE

- Mon, Jan 18, 13:30-15:00
- Mon, Feb 22, 13:30-15:00
- End of Feb DIRC15 Paper
- **Mon, Mar 21,** 13:30-15:00
  - **All basic content and results to be in**
- **Mon, Apr 04,** 13:30-15:00
- **Mon, Apr 18,** 13:30-15:00, and
- **Mon, May 09,** 13:30-15:00
- **Mon, May 23,** 13:30-15:00

- **Wed. May 25,** Draft to the Collaboration

- **Mid June,** Presentation of the Draft