HIM
Helmholtz-Institut Mainz

panda

JG|U
JOHANNES GUTENBERG UNIVERSITÄT MAINZ

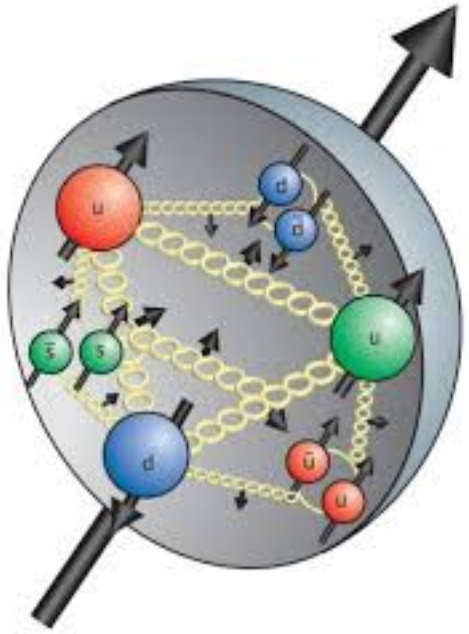
Electromagnetic and hard exclusive processes at PANDA
Current activities

Alaa Dbeyssi (for the EMP working group)

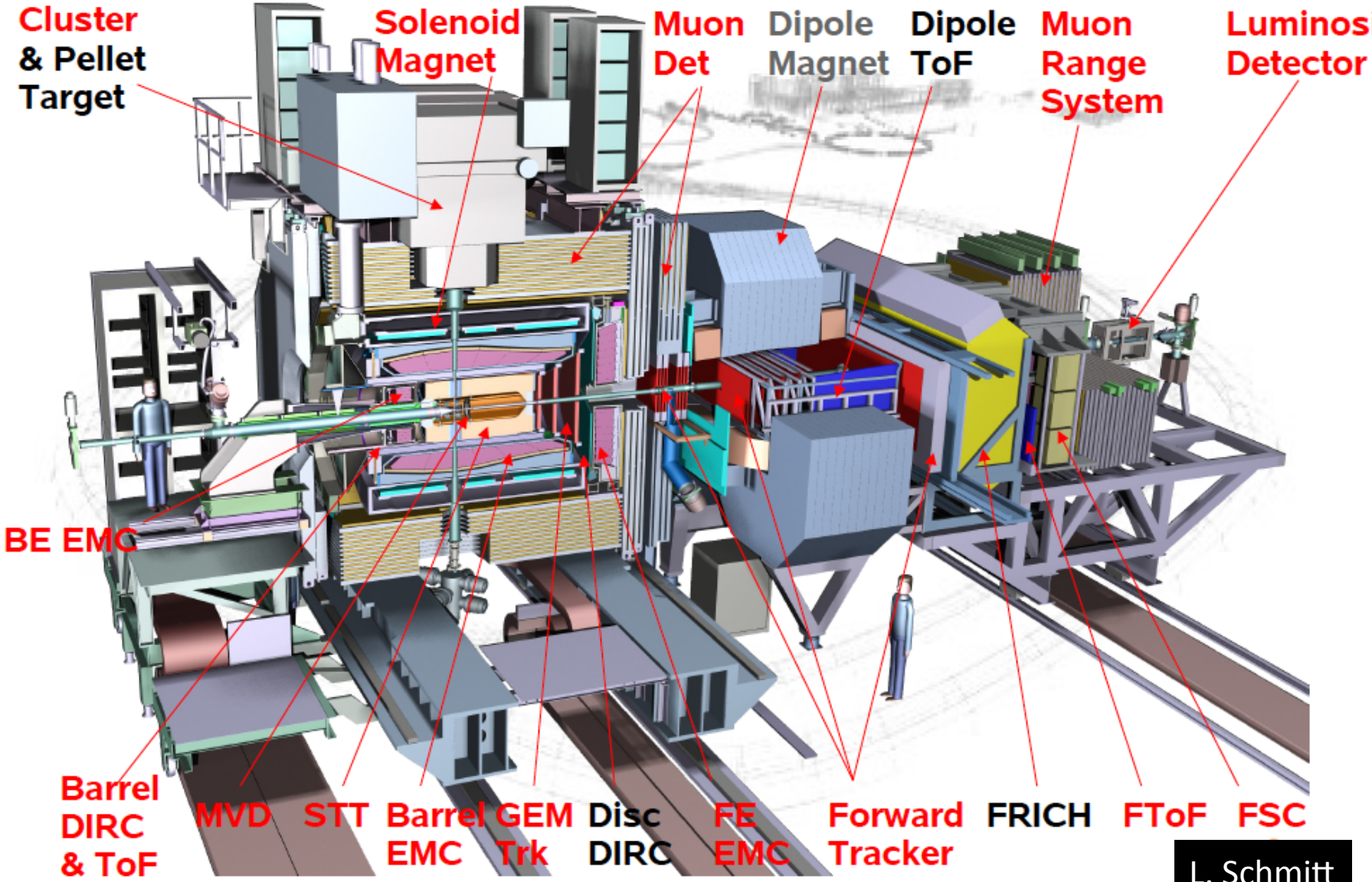
PANDA Collaboration Meeting 6-9 June 2017

Helmholtz-Institut Mainz
Johannes Gutenberg University

FAIR
Facility for Antiproton and Ion Research in Europe GmbH



PANDA Detector (Phase 1)



L. Schmitt

PANDA Detector (Phase 1)

Cluster & Pellet Target | Solenoid Magnet | Muon Det | Dipole Magnet | Dipole ToF | Muon Range System | Luminosity Detector

PANDA Phase-1:

- **Reduced detector setup**
- **Reduced luminosity by a factor ~20 compared to the HL mode**
- **PANDARoot simulations for the EM processes of high cross section, are needed:**

$\bar{p}p \to e^+e^-$ $\bar{p}p \to e^+e^-\pi^0$

$\bar{p}p \to \mu^+\mu^-$ Form factors (FFs)

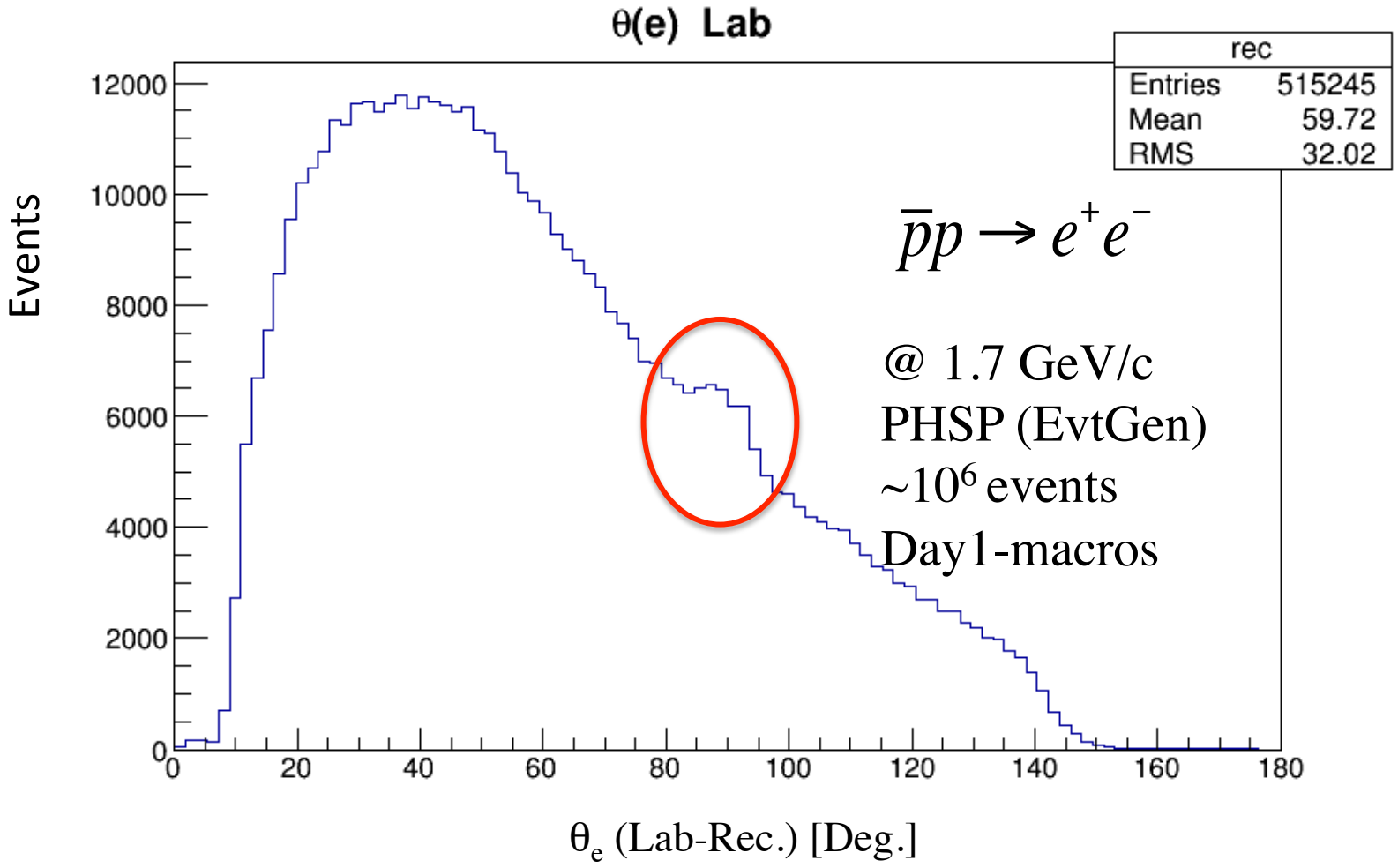
GDAs $\bar{p}p \to \gamma\gamma$

$\bar{p}p \to \pi^0\gamma$

- **New official release (Feb17P1) of PANDAROOT for Phase 1 simulations (reduced setup) is available**

L. Schmitt

Tests with *Feb17P1* PANDARoot release (PHASE1)



Simulations with PANDARoot rel. Feb17p1

$\bar{p}p \rightarrow e^+e^-$

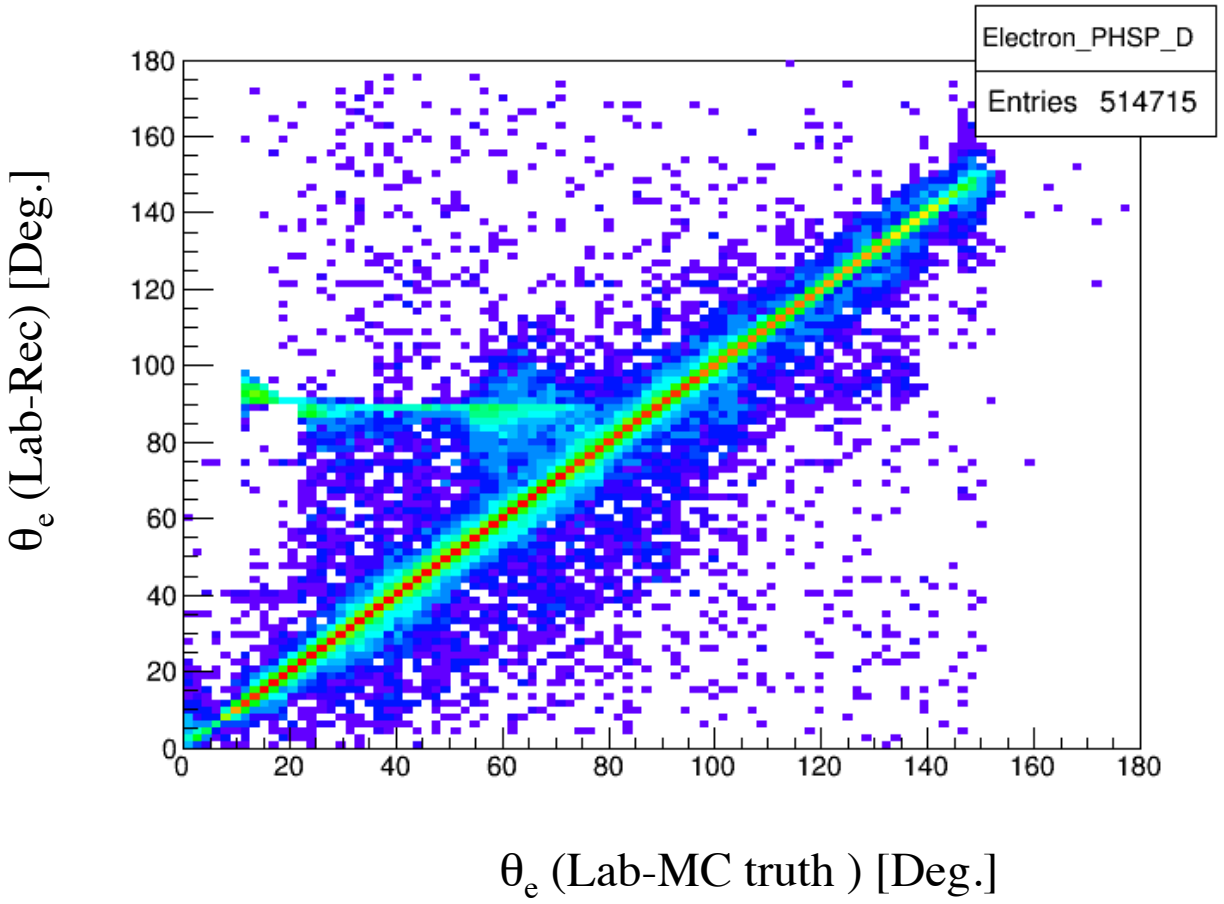
@ 1.7 GeV/c
PHSP (EvtGen)
$\sim 10^6$ events
Day1-macros

- Same problem with Full detector setup macros

- Same problem with:

$\bar{p}p \rightarrow \pi^+\pi^-$

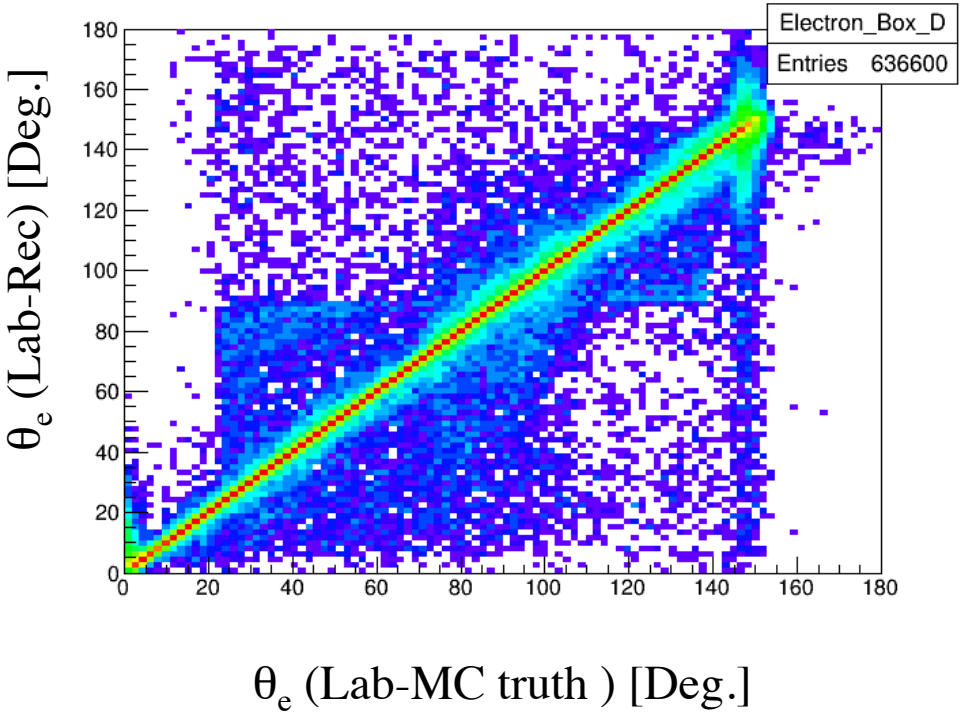
@ 1.7 GeV/c
$\sim 10^6$ events
PHSP (EvtGen)

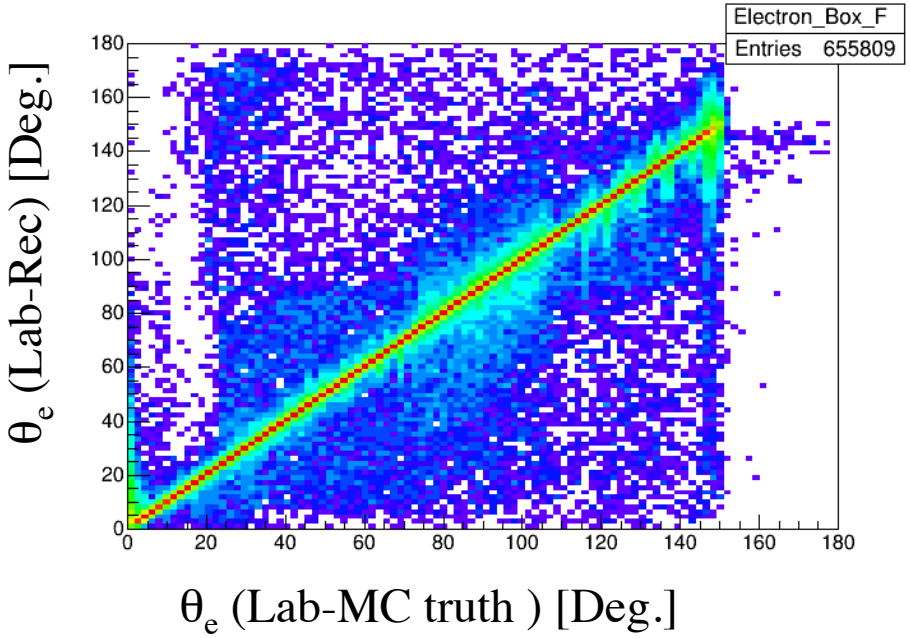


PndLepLepGenerator, PndPiPiGenerator are not compiled with Feb17p1 release

Simulations with PANDARoot rel. Feb17p1

"box:type(Electron):
P(0,2 GeV/c) : theta(0, 180°) :
Phi(0, 360°)"
~10^6 events
Day1-macros

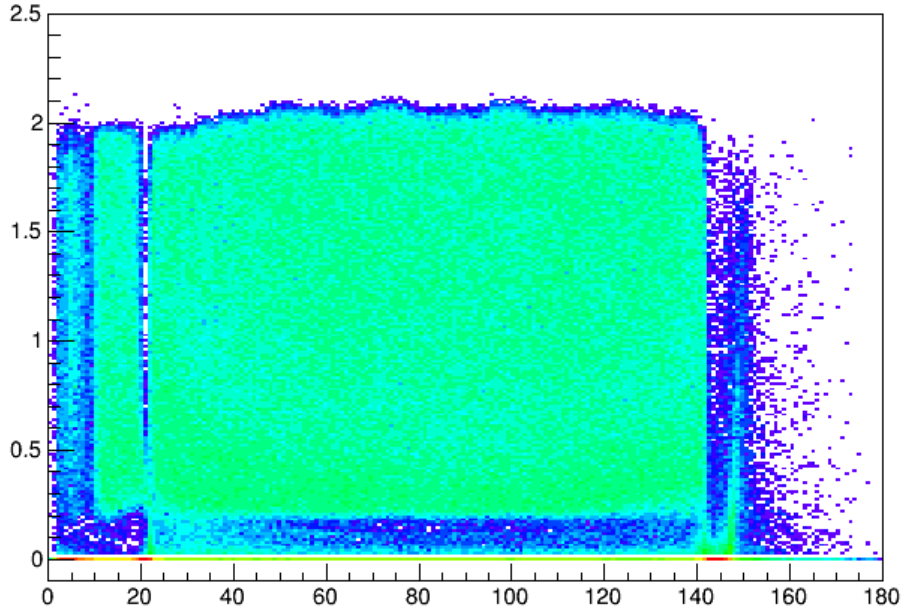


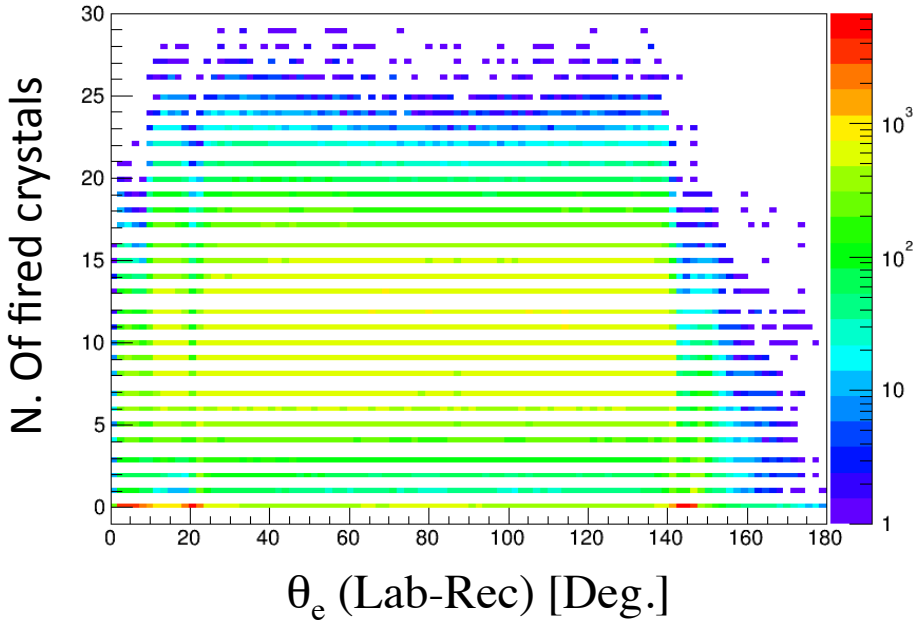


"box:type(Electron):
P(0,2 GeV/c) : theta(0, 180°) :
Phi(0, 360°)"
~10^6 events
Macros: Full detector setup

Simulations with PANDARoot rel. Feb17p1

"box:type(Electron):
P(0,2 GeV/c) : theta(0, 180°) :
Phi(0, 360°)"
Day1-macros

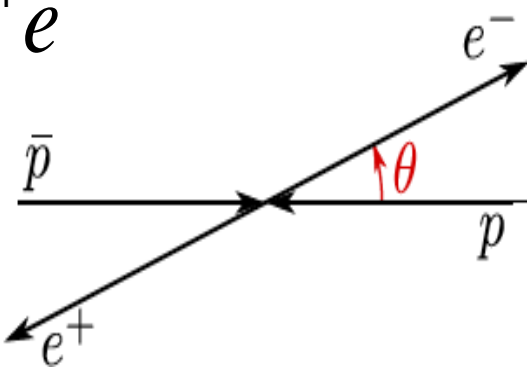




	θ_{min}	θ_{max}
FWEC	5.0°	25.0°
Barrel	22.0°	142.0°
BWEC	149.1°	166.6°

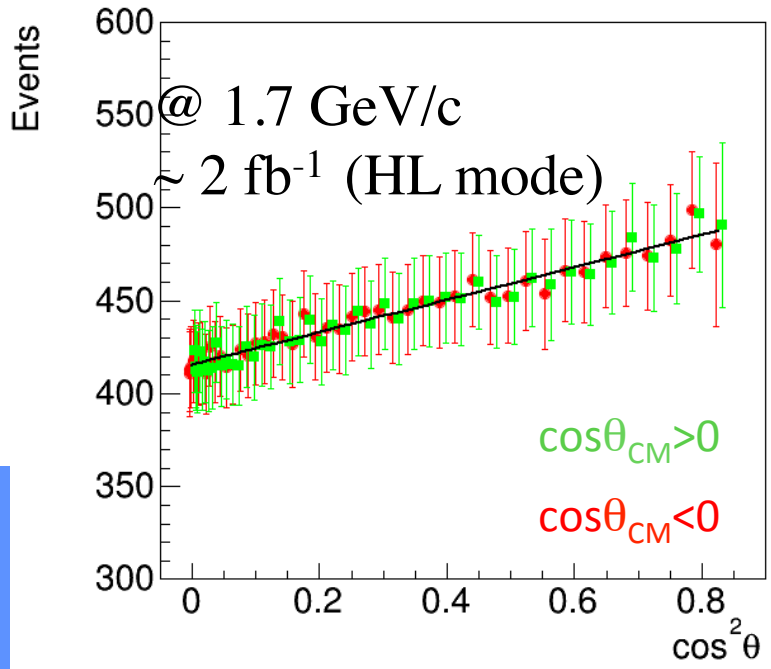
Measurement of the proton form factors at 1.7 GeV/c

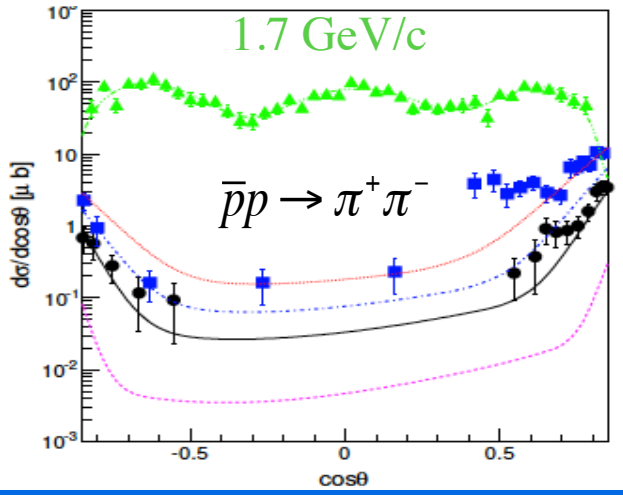
$\bar{p}p \rightarrow e^+e^-$



- Fit to $Cos\theta_{CM}$=[-0.8 , 0.8], 1.7 GeV/c
- Statistical error: ΔR/R~1.4% (R=1)
- Day-1 luminosity (~ 0.1 fb^{-1}) -> ΔR/R~5.4%

- Fit to $Cos\theta_{CM}$=[-0.9 , 0.9] , 1.7 GeV/c
- Statistical error: ΔR/R~1.0% (R=1)
- Day-1 luminosity (~ 0.1 fb^{-1}) -> ΔR/R~4.2%





Current activities

- Form factors with electron pairs: development of an **event generator** for the channel "p-pbar -> e+ e-" including the Born amplitude, and **next-to leading order** virtual and real QED radiative corrections

$\bar{p}p \rightarrow e^+e^-$

- Form factors with muon pairs: the analysis (Full luminosity and full detector setup is completed); the RN is currently under review (PANDA review process)

$\bar{p}p \rightarrow \mu^+\mu^-$

- Form factors in the unphysical region: the feasibility studies with PANDARoot are ongoing.

$\bar{p}p \rightarrow e^+e^-\pi^0$

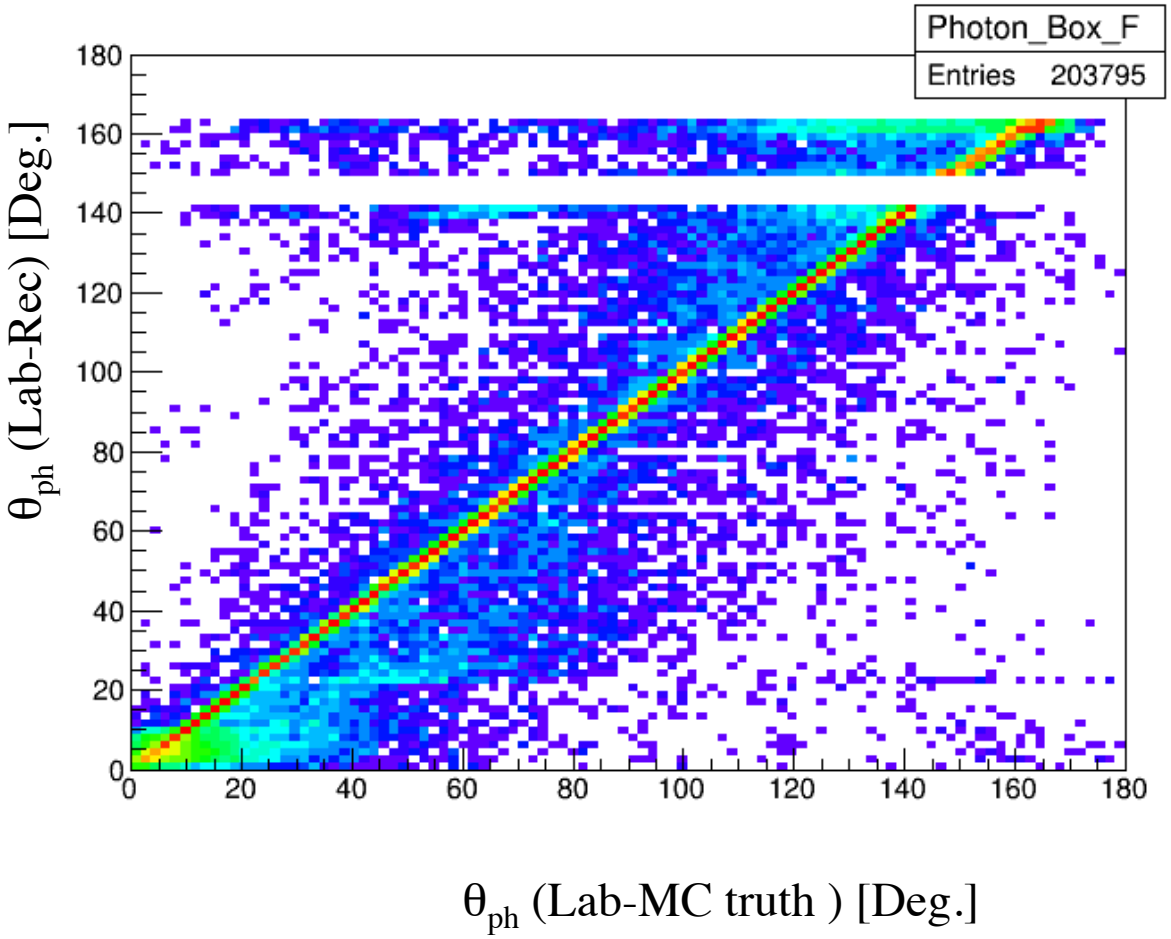
- **Preparation for the Day1-experiment:**
  - Low luminosity by a factor ~ 20 compared to the HL mode
  - Reduced detector setup

$$\bar{p}p \rightarrow e^+e^- \qquad \bar{p}p \rightarrow \mu^+\mu^- \qquad \bar{p}p \rightarrow e^+e^-\pi^0$$

Back-up slides

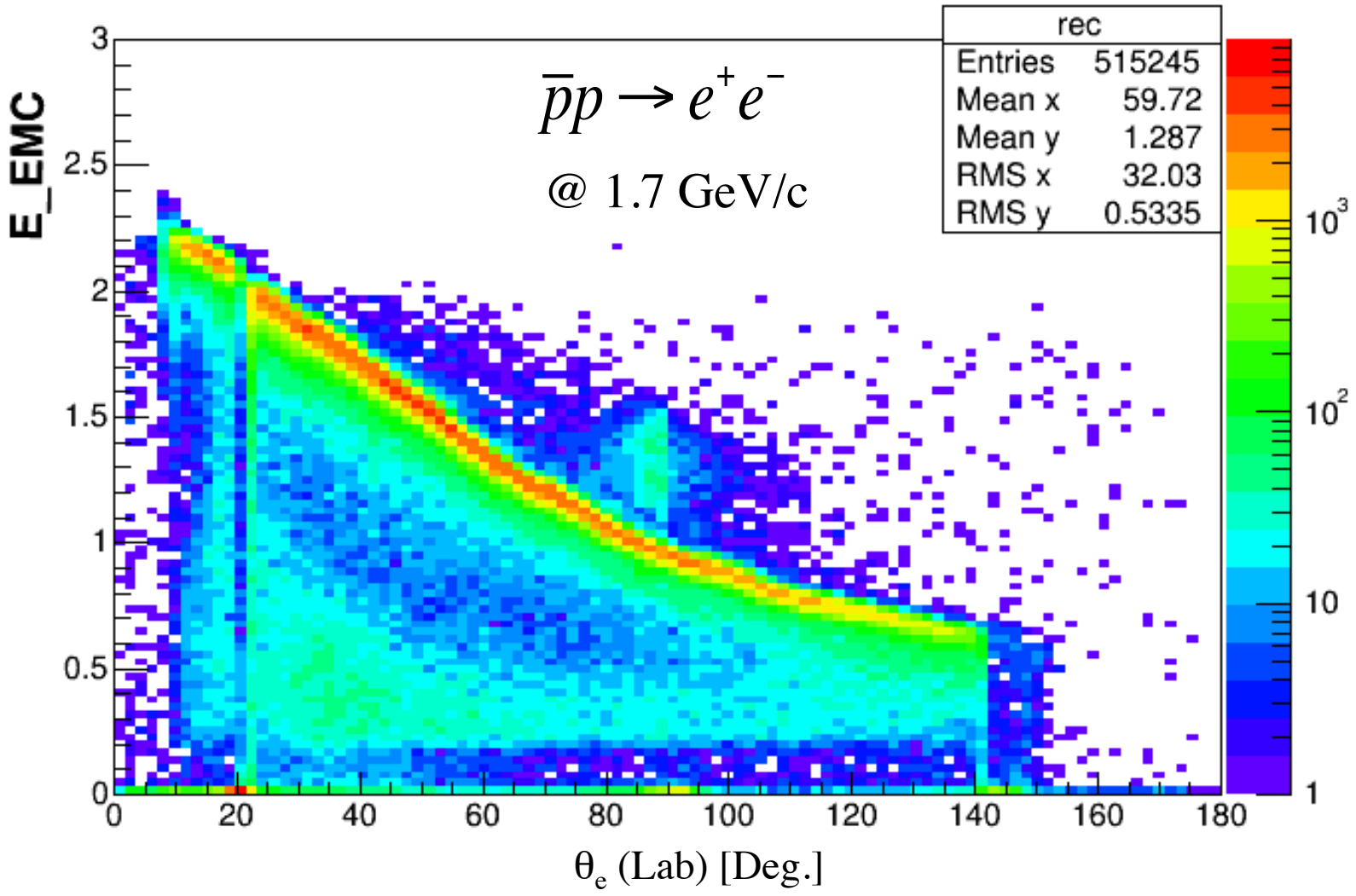
Simulations with PANDARoot rel. Feb17p1

"box:type(Photon): P(0,2 GeV/c) : theta(0, 180°) : Phi(0, 360°)"
Macros:Full detector setup

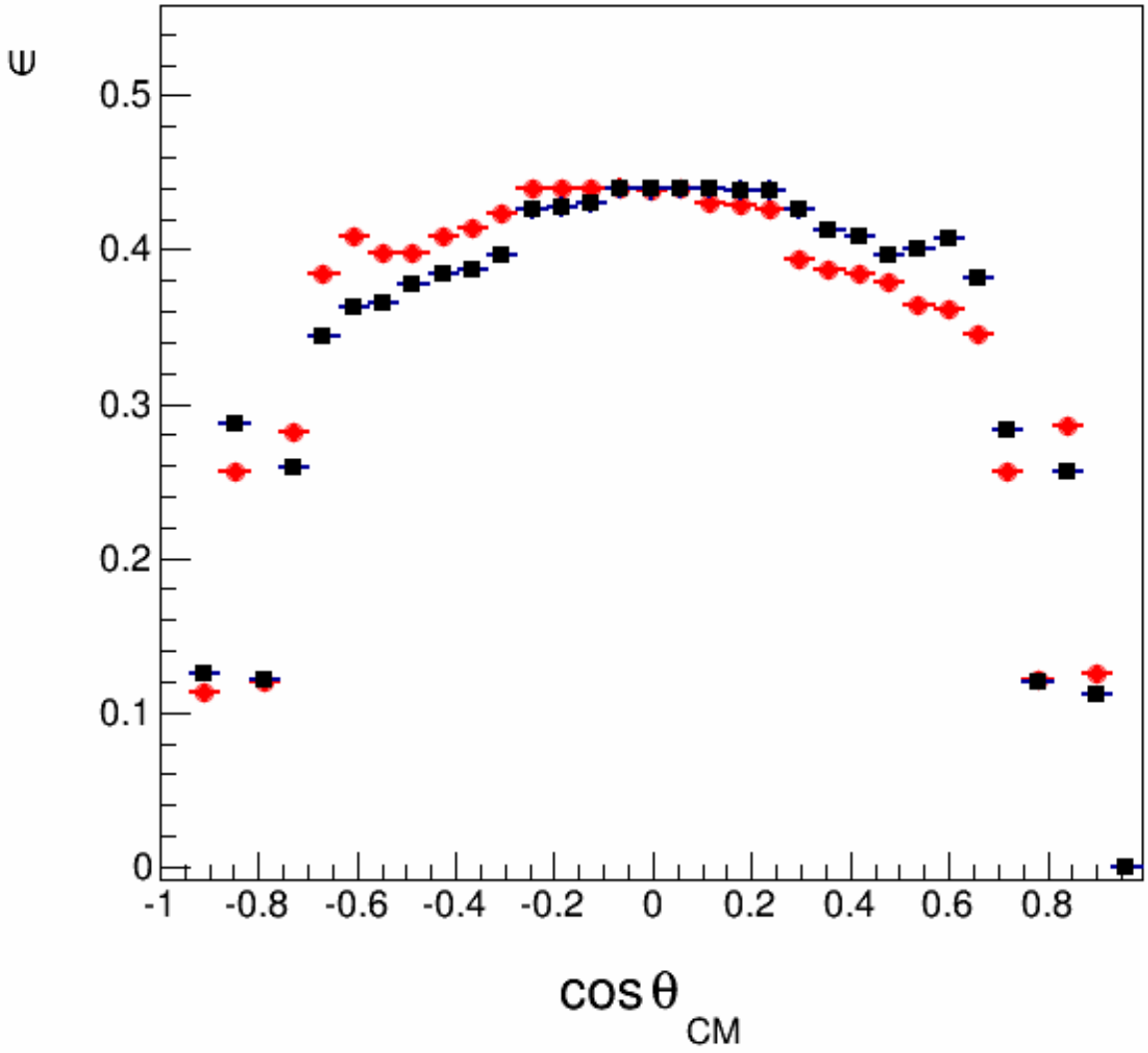


Tests with *Feb17P1* PANDARoot release (PHASE1)

Deposit energy in the EMC



Tests with *Feb17P1* PANDARoot release



$\bar{p}p \rightarrow e^+e^-$

@ 1.7 GeV/c