Outline

Introduction
HESR: High-Energy Storage Ring
Prototyping of HESR components
Beam Experiments at the Cooler Synchrotron COSY
Summary

Contribution to ELENA
Facility for Antiproton and Ion Research

- p-Linac
- SIS18
- SIS100
- HESR
- CR/RESR
- Antiprotons Production Target

Rudolf Maier
Criteria for the Layout of the HESR

HESR design driven by the requirements of PANDA:

- Antiprotons with $1.5 \text{ GeV/c} \leq p \leq 15 \text{ GeV/c}$
- High luminosity: $2 \cdot 10^{32} \text{ cm}^{-2}\text{s}^{-1}$
  - Thick targets: $4 \cdot 10^{15} \text{ cm}^{-2}$
- High momentum resolution: $\Delta p/p \leq 4 \cdot 10^{-5}$
  - Phase space cooling
- Long beam life time: $>30 \text{ min}$
HESR with PANDA and Electron Cooler

HESR Consortium: Germany (Jülich, GSI, Mainz), Romania and Slovenia
HESR Prototyping and Tests

Pellet Target

100 KeV e-Cooler

WASA

Barrier Bucket Cavity

Stochastic Cooling

Residual Gas Profile Monitor

2 MeV e-Cooler
Example: Beam Cooling with WASA Pellet Target

- a) Injected beam
- b) Beam heated by target
- c) + stochastic cooling
- d) + barrier bucket

Graph showing particle density (arb. units) vs. frequency (GHz) with peaks at different stages of beam cooling.
Summary

Hadron Physics with Antiprotons

- Sophisticated accelerators
- Forefront beam cooling
- Internal targets
- RF manipulation techniques
Contribution to ELENA

IKP at the research center Juelich has a long standing tradition of significant contributions to the facility and physics program at the CERN-AD.

We fully support constructing the ELENA ring to increase the phase space density of the cooled antiprotons.
Contribution to ELENA

In the application phase of ELENA we have agreed to contribute the equivalent of 3 person-years to the construction efforts, and now that ELENA has been approved, we remain dedicated to this pledge.

Currently our electronic and mechanical workshops are fully booked, however we are happy to discuss workpackages that match the time schedules, as well as other contributions that require other resources.
Contribution to ELENA

H⁻ Source

Running H⁻ Sources since 1995 for Injection into Cyclotron
COSY Cycle for spin-filtering at 49.3 MeV

Beam intensity

Total trigger rate

2 Spin Flips
DAQ stopped
Target off

Pressure at filter target

Pressure at deuterium target

16000s of spin-filtering

2500s of polarisation measurement

Rudolf Maier