Commissioning of the 2 MeV COSY Electron Cooler in Juelich

June 11, 2013 | Vsevolod Kamerdzhiiev for BINP and COSY teams
COSY accelerator facility

COSY accelerates (polarized) protons and deuterons between 300/600 and 3700 MeV/c

4 internal and 3 external experimental areas

Electron cooling at low momenta
Stochastic cooling at high momenta
Low energy electron cooler

Design values:

Electron energy up to 100 kV

Electron current up to 3 A
Stochastic cooling

2 Pickup-Tanks, 4m long, cooled to 20 K
2 Kicker-Tanks, 2 m long
Frequency range: 1.0-1.8 GHz and 1.8-3.0 GHz
Adjustable delays for different particle velocities above $\beta=0.85$
Longitudinal notch filter cooling with the vertical system in „sum-mode“
Internal Target Experiments at COSY

ANKE

Dipole spectrometer
Polarized target
Cluster target
Solid state target
Internal Target Experiments at COSY

WASA
Solenoidal field
Pellet target
Motivation for a 2MeV electron cooler

Electron cooling up to maximum momentum in COSY

Improve beam quality and beam life time with dense internal targets

Study beam equilibrium under the influence of:
- internal targets
- barrier bucket cavity
- stochastic cooling
- electron cooling

Future developments for HESR@FAIR
Benefits of electron cooling

- 1 MeV electrons
- 10 mm e-beam Ø
- 2 kG at cooler section
- Target density $10^{15}$ 1/cm$^2$

TUXCH01 talk by V.V.Parkhomchuk, RuPAC12
Benefits of electron cooling

1 MeV electrons
10 mm e-beam Ø
2 kG at cooler section
Target density $10^{15} \text{1/cm}^2$

TUXCH01 talk by V.V. Parkhomchuk, RuPAC12
Why BINP?

Electron cooling was proposed by G.I. Budker in 1966

BINP electron coolers for accelerators around the world:

NAP-M, LEIR, SIS18, CSRm, CSRe, COSY
Brief history of the 2MeV cooler project

2003 - initial idea and discussion at BINP, J. Dietrich, V.V. Parkhomchuk
May 2005 – “Feasibility study of 2 MeV electron cooling for COSY” by V.V. Parkhomchuk’s group, BINP
Sept. 2005 – “COSY 2MeV Cooling System Proposal”, talk by J. Dietrich at COOL05, Galena + working group on COSY 2MeV Cooler
March 2009 – funding in Jülich
July 2009 – contract FZJ-BINP
Nov. 2009 - CDR, Electron Cooler for COSY 2 MeV
2012 – e-beam commissioning at BINP
Dec. 2012 - delivery to COSY, Jülich
April 2013 – begin installation into COSY
2MeV electron cooler - design
2MeV electron cooler – integration into COSY
Shipping the cooler

Unloading the trucks in Jülich, 91 items in 2 trucks, 5 Dec. 2012
The Installation team


**COSY team**
Making Space Available (shutdown in 2010)

Place for the new cooler
Preparation of COSY
Preparation of cooler components
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Installation
Current status

Magnets installed
Water cooling is established
Vacuum system assembled (except Wien filter and collector)
Vacuum baking complete
HV Sections are installed and tested
Cascade transformer is installed and tested
Oil system installed
BPMs and electronics installed and tested
Wien filter is being repaired
Expected installation in about a week
200 kV voltage demonstrated at HV terminal
Further presentations

Please see poster presentations by the BINP colleagues

Thank you