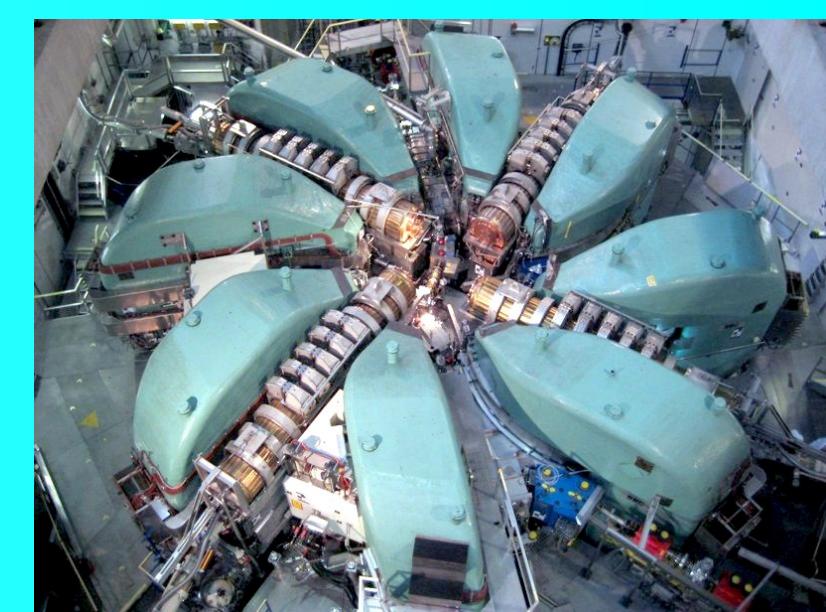
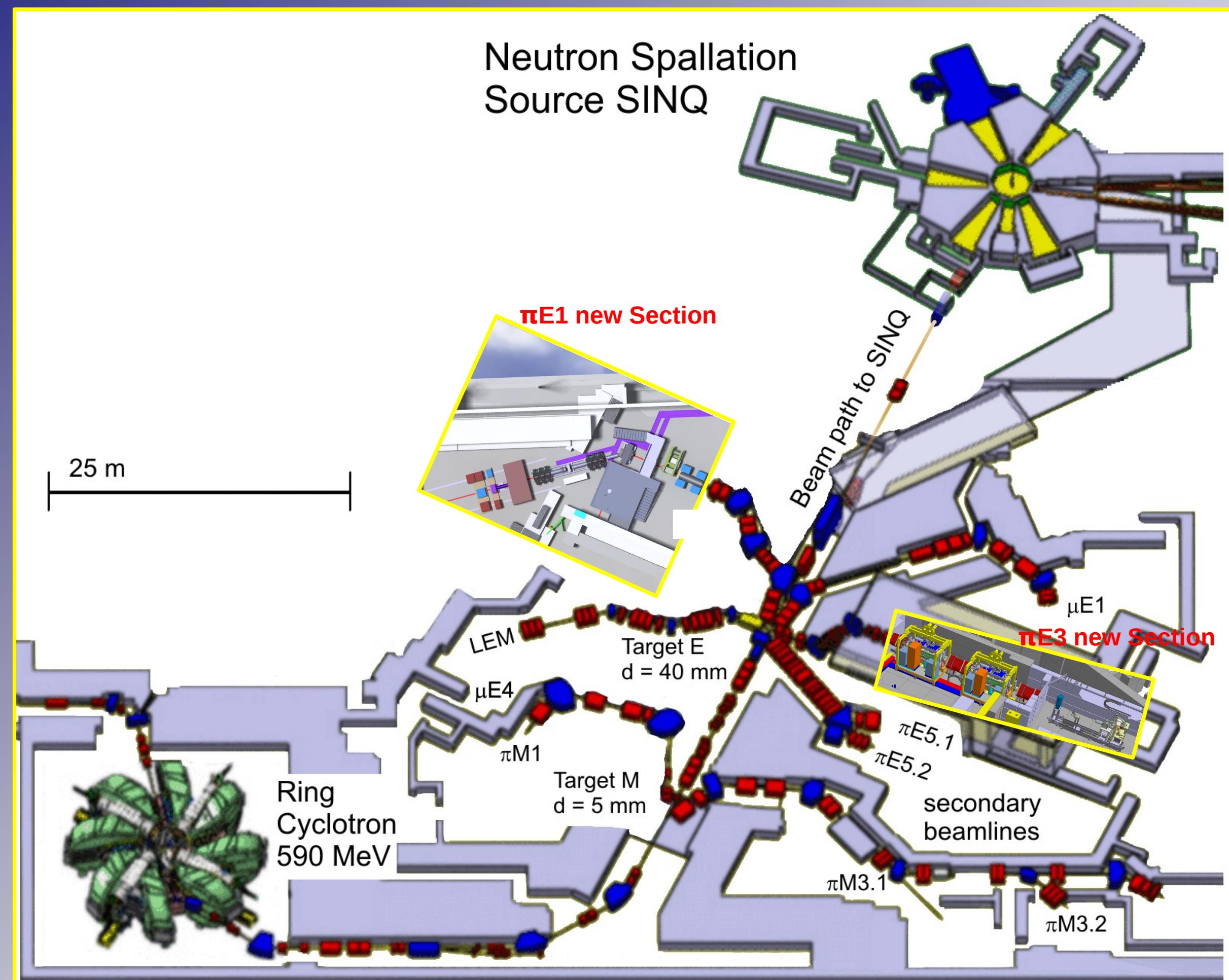


# PSI Secondary Beam Lines Customized to New Experiments

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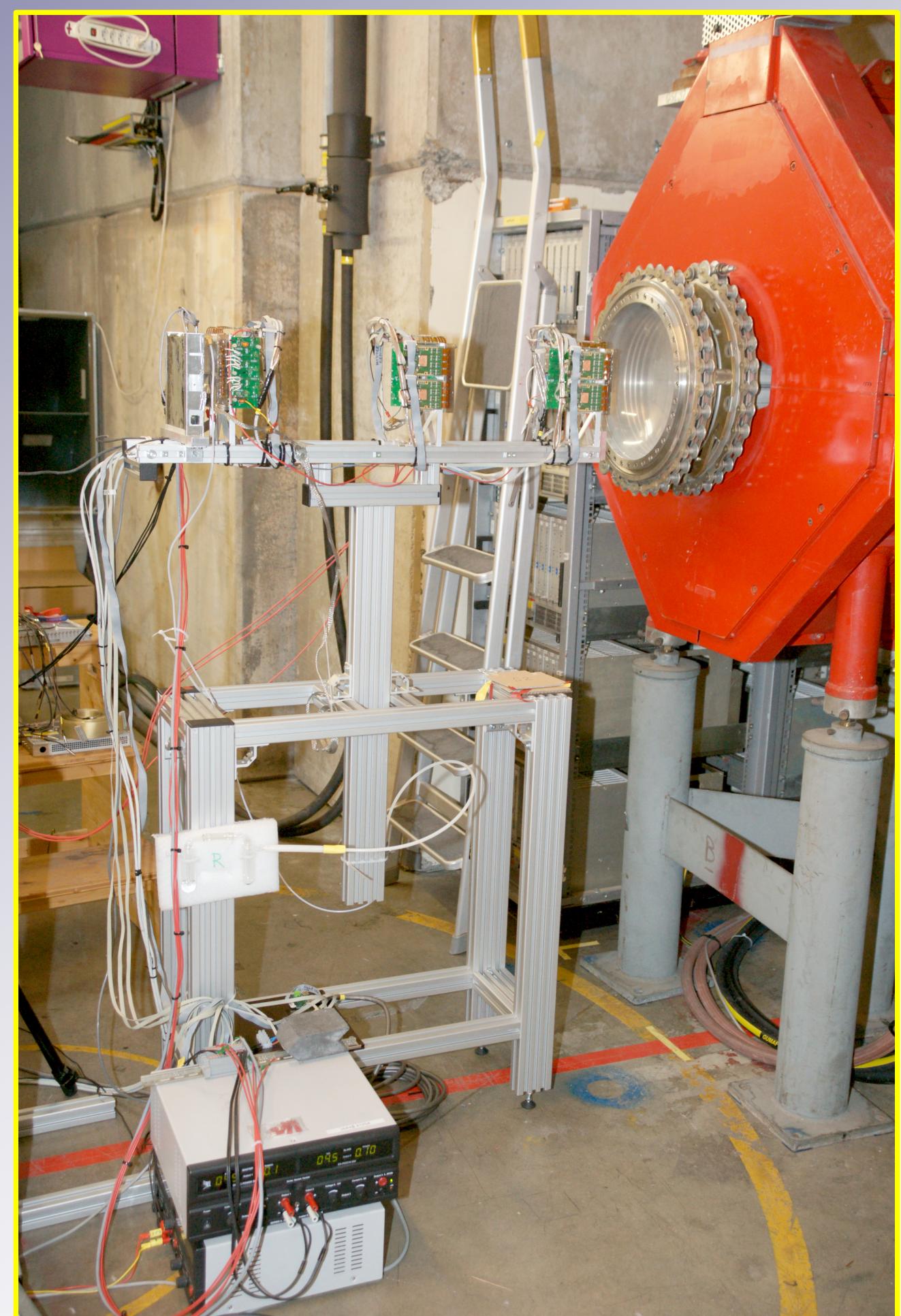
## The PSI Proton Accelerator Complex



## User Support at the πM1 Beam Line

### Beam Line Features

- $\pi^\pm$  Beam 100 – 500 MeV/c
- $\pi^+$  flux  $> 10^8$  part/s (250 – 450 MeV/c)
- Spot size on target (FWHM):  $8 \times 8 \text{ mm}^2$
- Beam contains also p,  $\mu^+$ ,  $e^+$



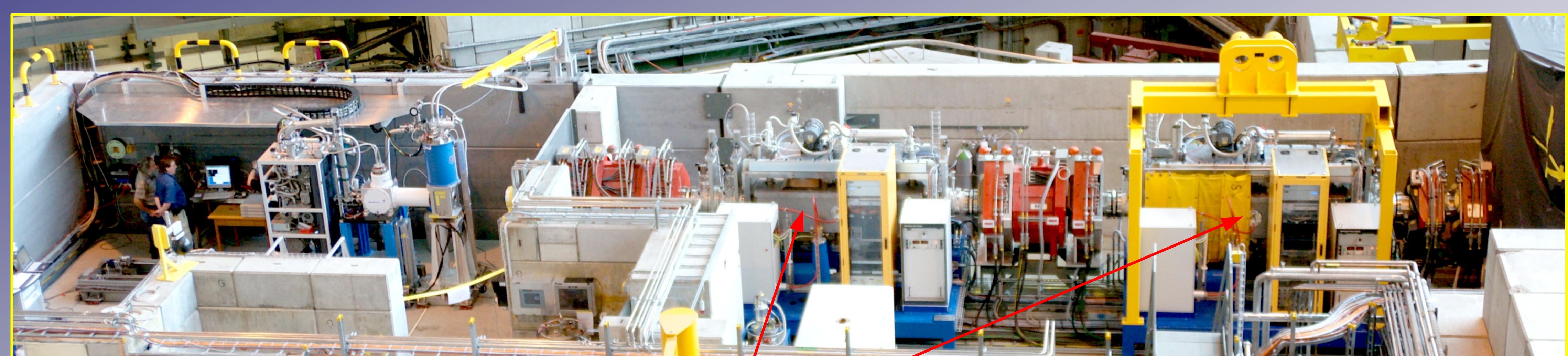
### Beam Studies and Tuning for:

- New MUSE experiment (under test)
- Detector test from several international groups (CERN, INFN, Universities)
- Students practica

## The High Field μSR Project at the πE3 Beam Line

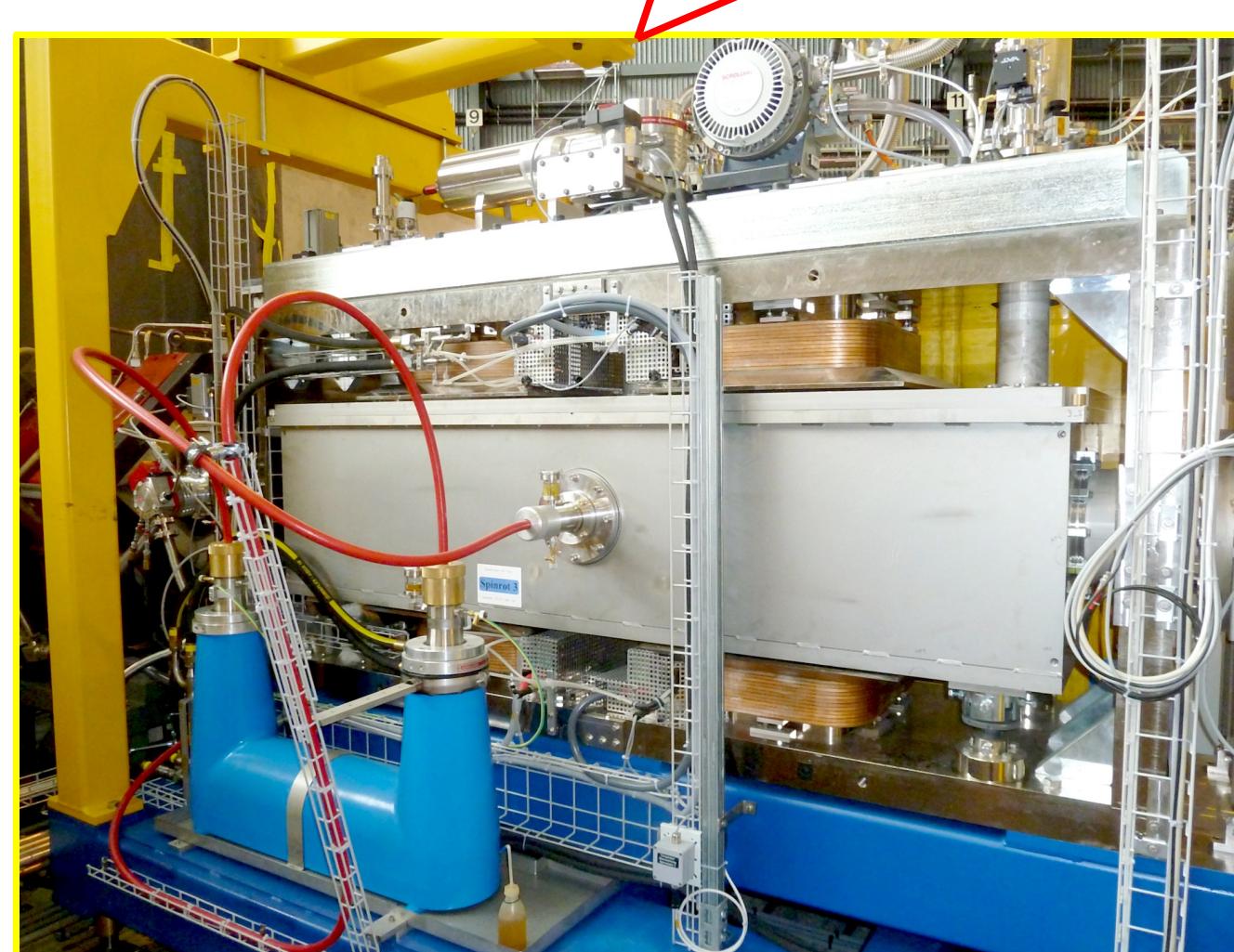
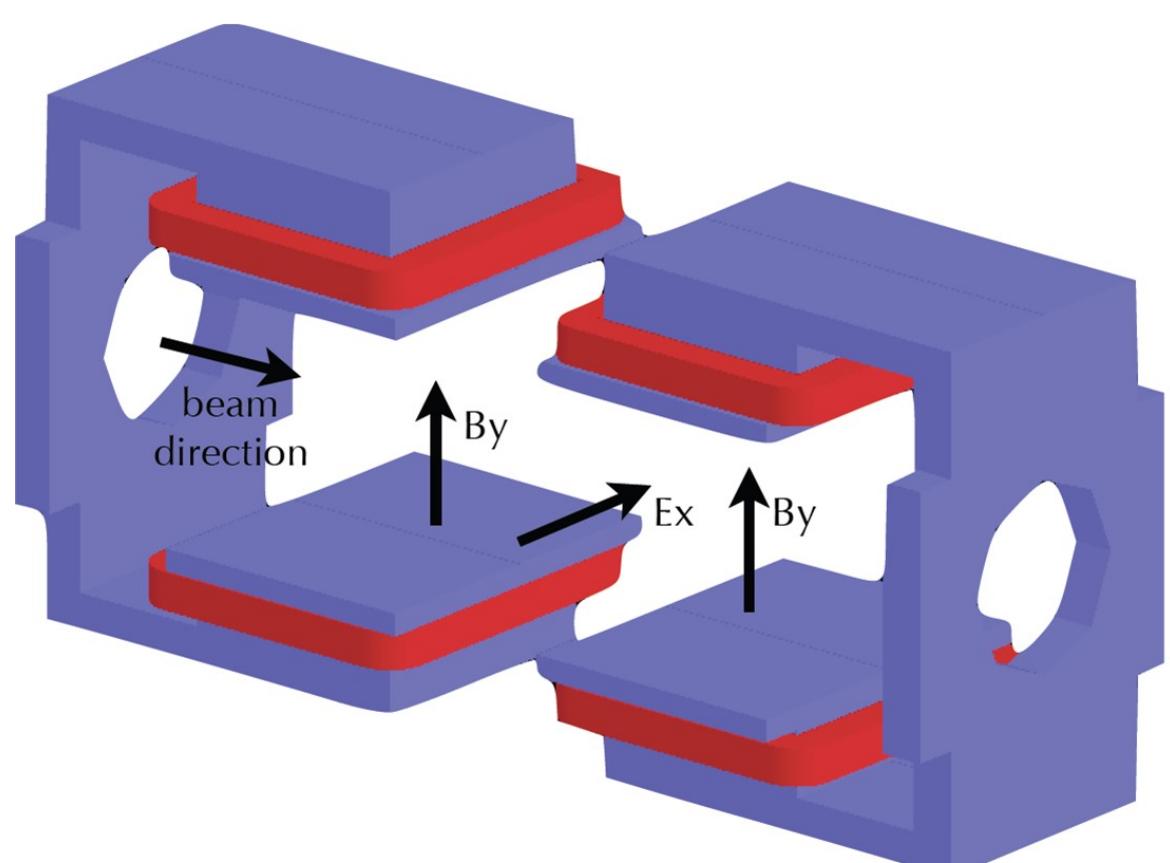
### High Field μSR at PSI

- μSR technique:
  - Muon Spin Rotation/Relaxation/Resonance
  - Probe extremely small local magnetic fields in any form of matter
- Worldwide unique 9.5T External Field
- Material T range: 0.02 K - 320K
- Installation completed in 2011



### Beam Line Requirements

- High intensity polarized surface muon beam (28 MeV/c)
- Transverse beam polarization at the sample material:
  - Spin rotators required!
- Beam size at sample:  $\sigma_{x,y} \approx 15\text{mm}$
- Beam size dependence on High Field
- Momentum bite at sample:  $\Delta p/p \approx 2\%$



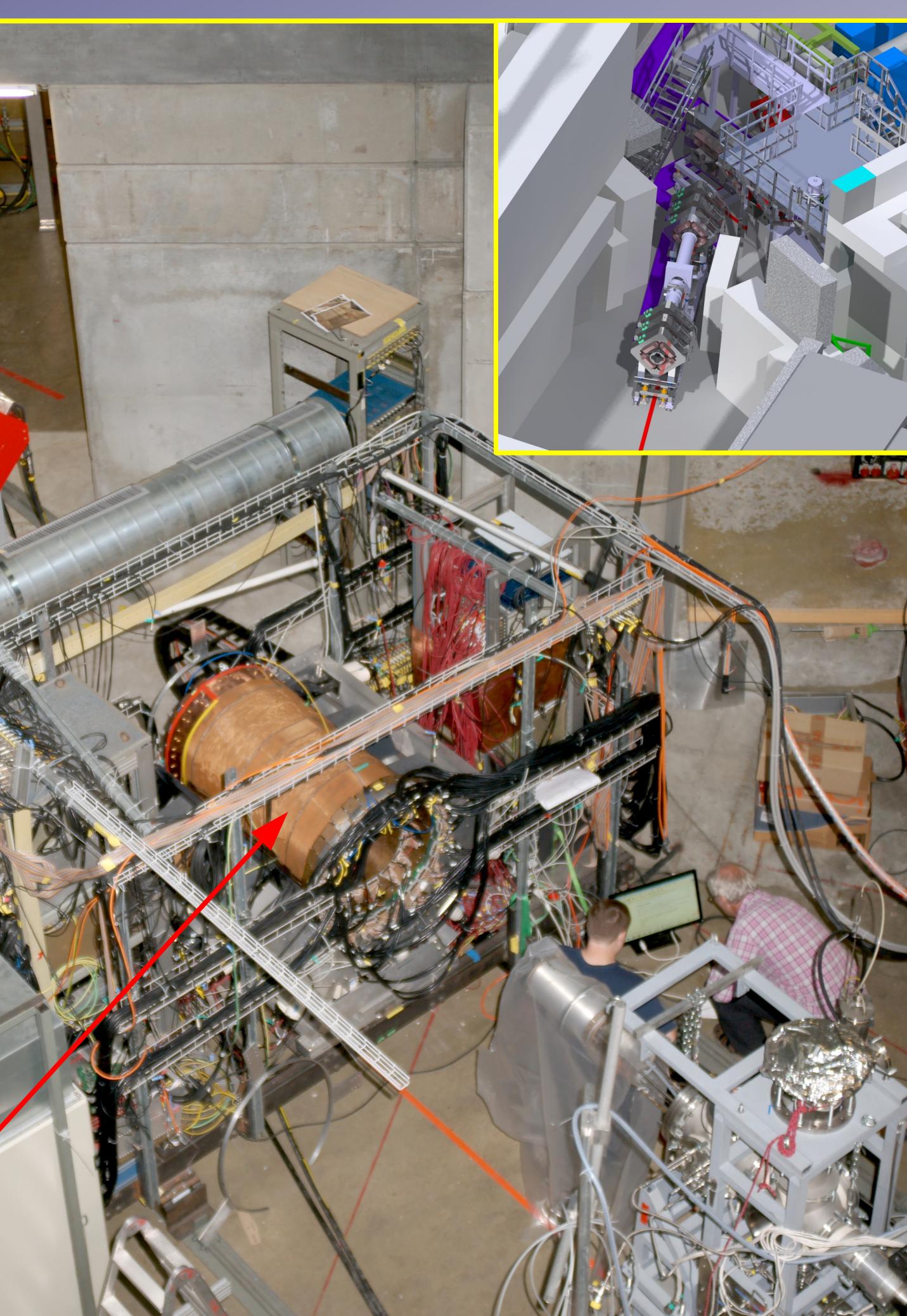
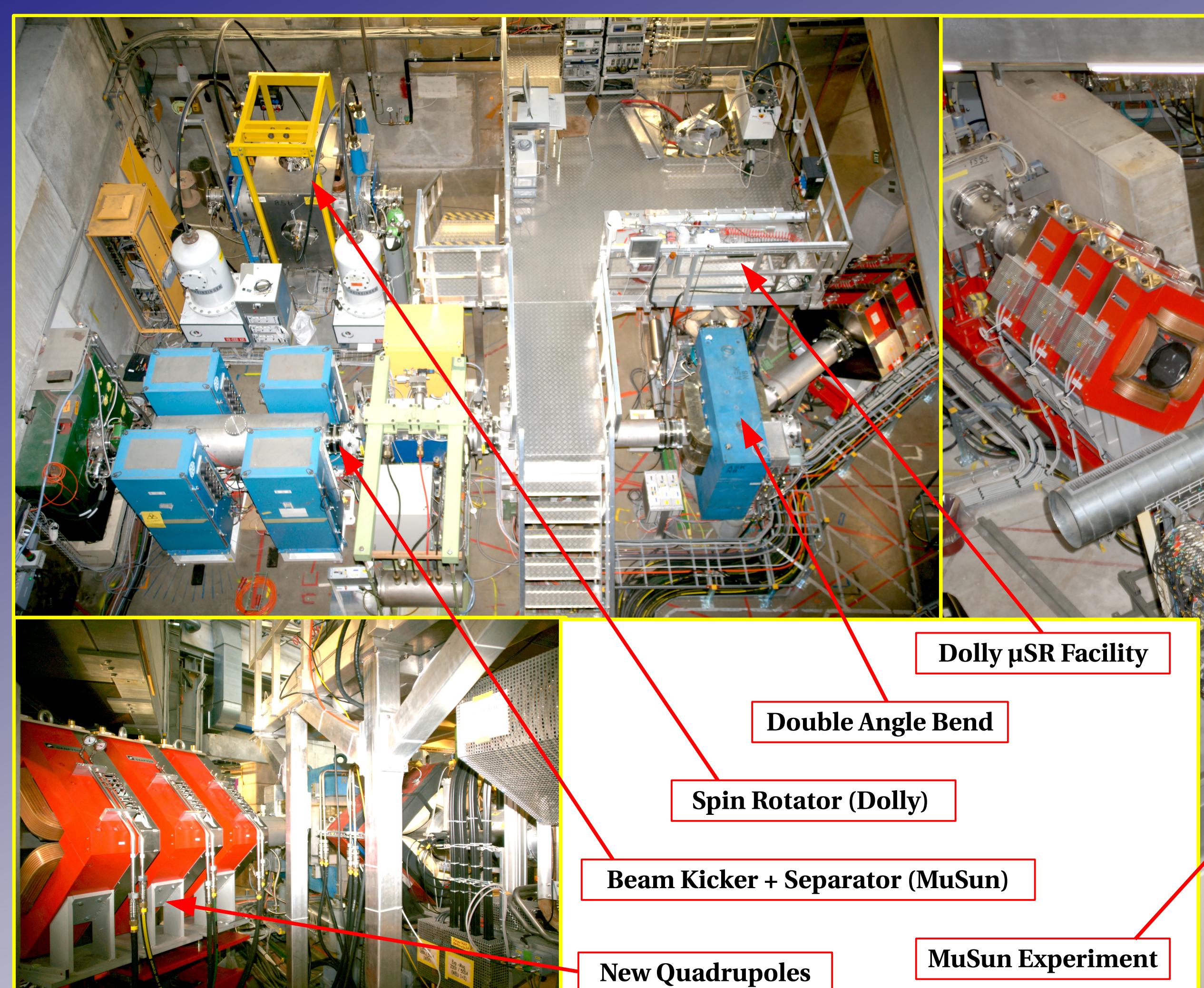
### Spin Rotators Design

- 90° spin rotation
- Typical rotation path (28 MeV/c)  $\approx 3\text{ m}$
- 2 SR devices, 45° each
- Crossed E,B static fields (Wien Filter)
- E and B field matching maximizes beam transmission

### E-Field

- Electrodes: gap = 12 cm, length = 180 cm
- HV NOMINAL =  $\pm 175\text{ kV}$

## Fit Dolly (μSR) and MuSun (Particle Physics) in the πE1 Beam Line



### Requirements

- Fit a μSR facility (Dolly) and a PP-experiment (MuSun) in the same beam line
- Minimize switching time and effort

### Implementation

- Double angle bending magnet:
  - 90° for Dolly (28 MeV/c)
  - 38° for MuSun (28 – 50 MeV/c)
- Six new quadrupoles to transport and focus the beam to the MuSun experiment
- Alternative employment of beam kicker + separator (MuSun) and spin rotator (Dolly)
- Dolly – MuSun switching time: 3 days
- Installation completed in September 2013