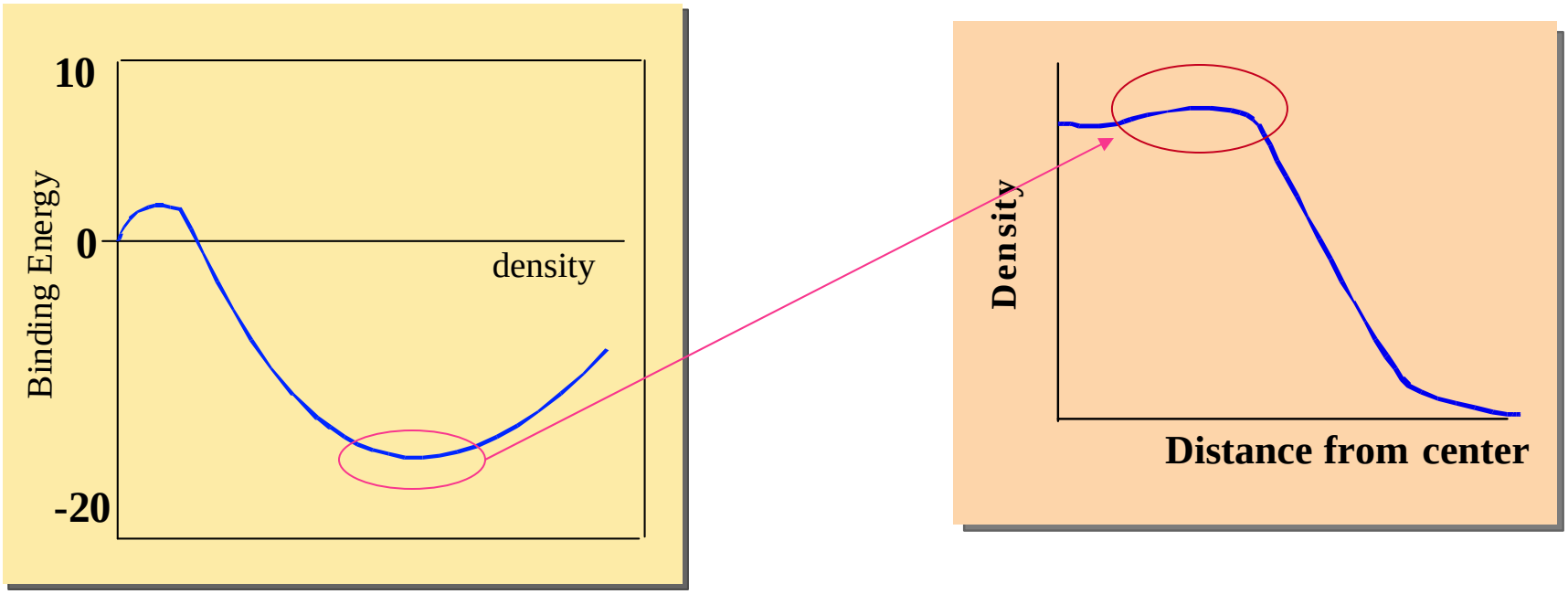
S272: Density distribution of ^{58,72}Ni and ^{72}Ge from proton elastic scattering

- **Spokesperson: Isao Tanihata, Rituparna Kanungo**
- **GSI contact: Chiara Nociforo?**
- **Approved in ~2001 with 60 shifts**
- **Would like to run the experiment either at the end of 2008 or the first half of 2009.**
- **Primary Beams: ^{86}Kr (500*A* MeV) 10^{10} /pulse**
  ^{58}Ni (300*A* MeV) 10^{5} /pulse
  ^{72}Ge (300*A* MeV) 10^{5} /pulse
- **Secondary Beam: ^{72}Ni (300*A* MeV)**
- **Detector system will be set up at S4 after FRS.**

Density Distribution and EOS

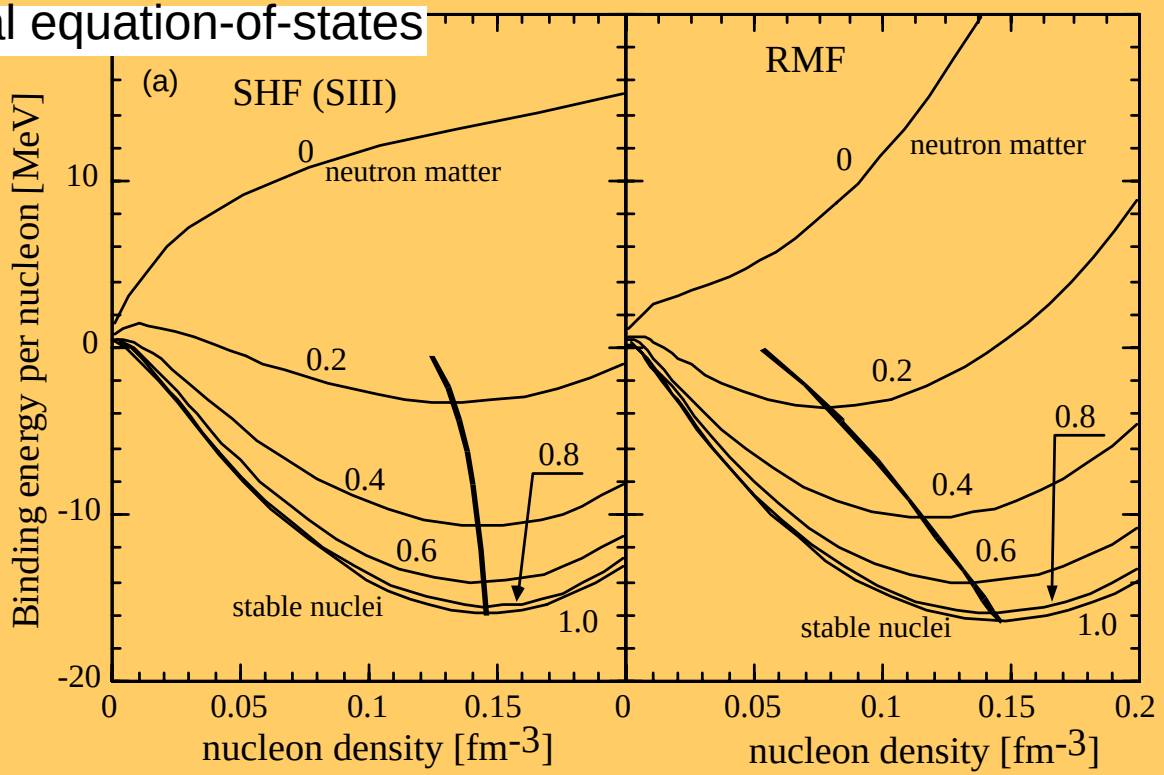
- **The saturation density of nuclear matter is reflected to the density of nucleus.**
- **-> Saturation density of nuclear matter can be determined from density distributions.**
- **-> EOS of asymmetric matter can be studied from density distribution of neutron rich nuclei.**



Difference of EOS between models

- **Saturation density behaves differently between two typical models. (Skyrme and Relativistic Mean Field)**

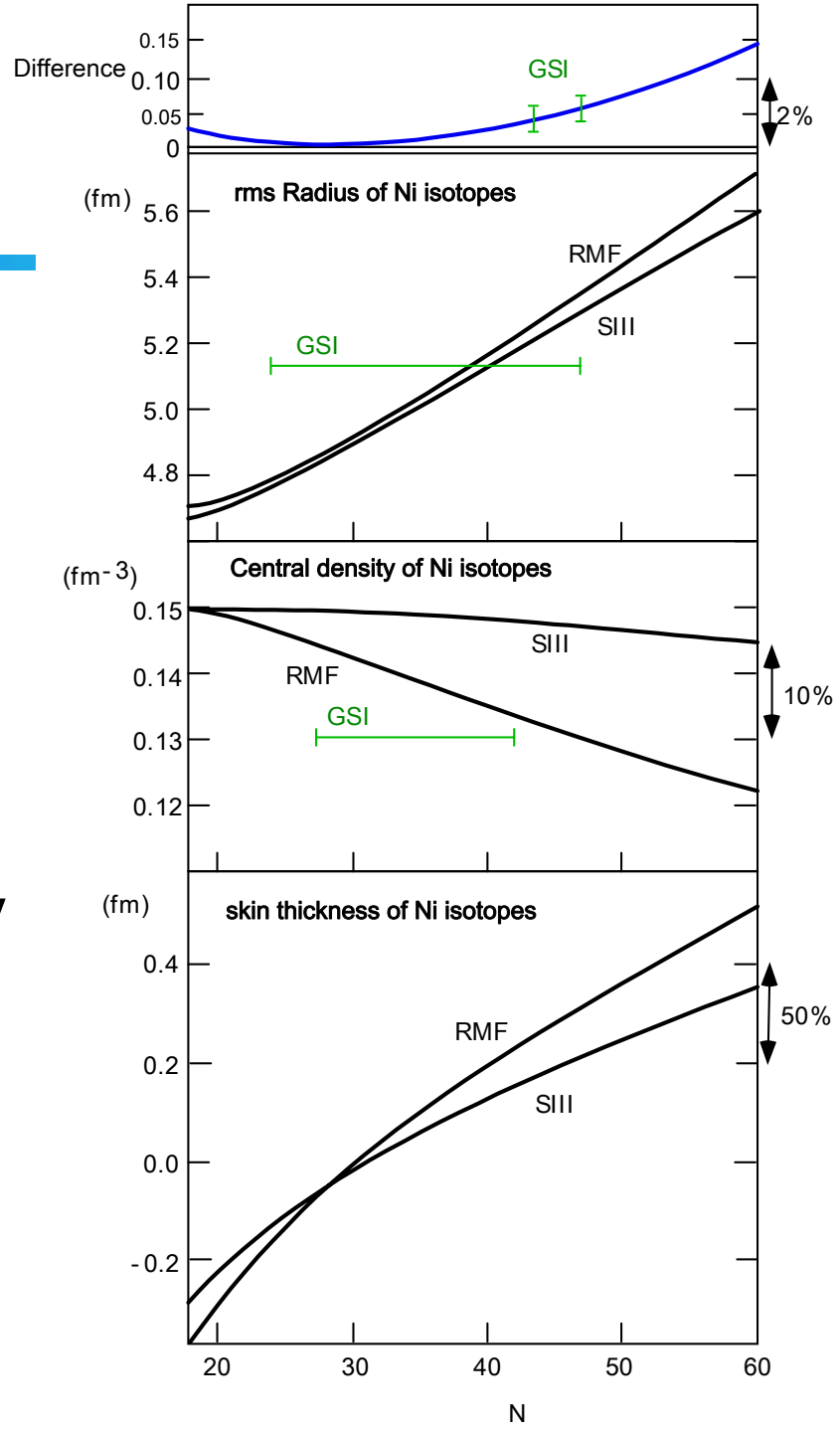
Two typical equation-of-states



The central density gives a guidance to the correct equation of state

Sensitivity of EOS

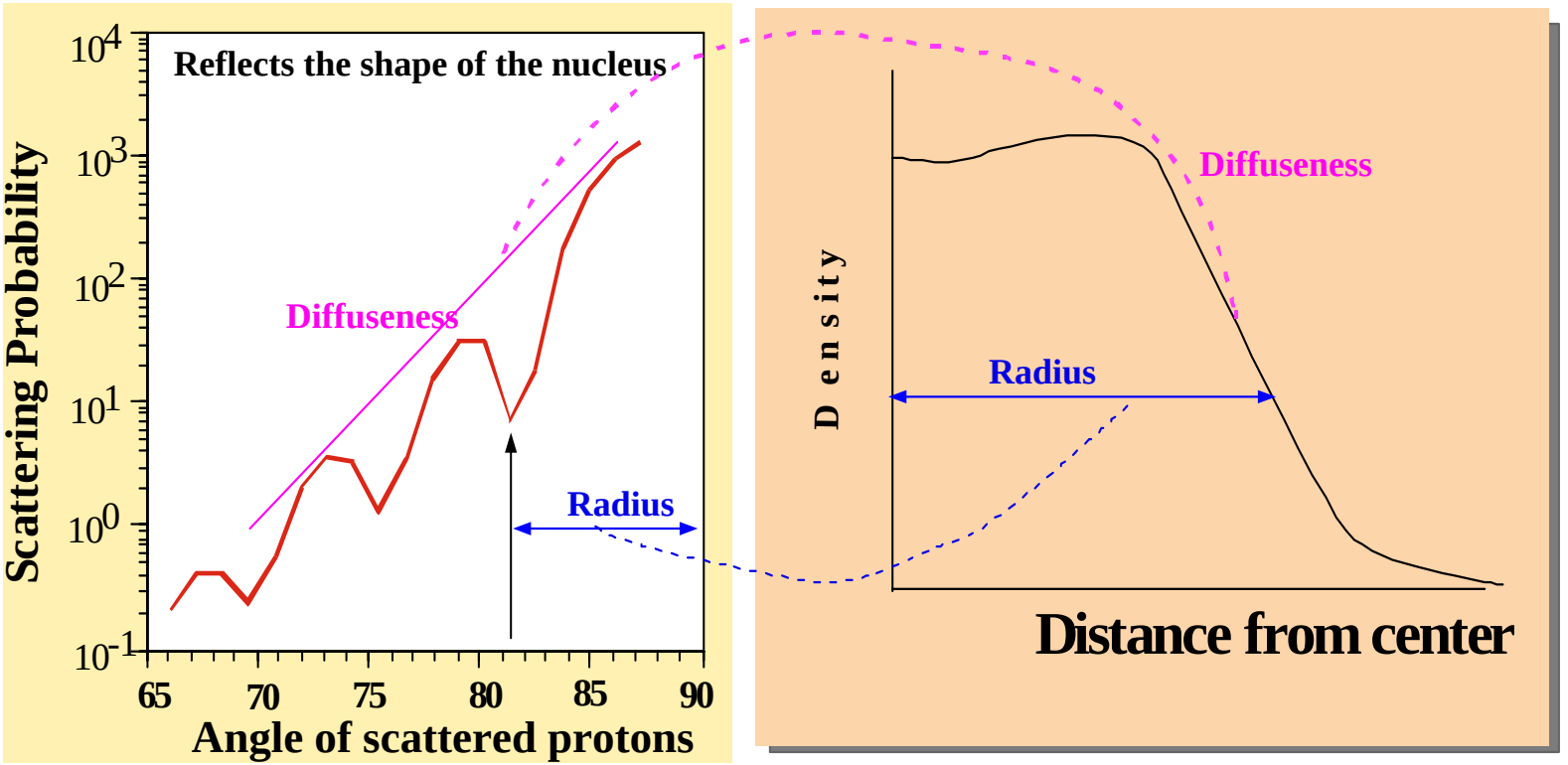
- The effect of the EOS difference is seen in radii, central density, and neutron skin thicknesses.
- The difference of radii is not very large.
- Densities provide sensitive means to distinguish EOSs.
- Skin thicknesses also give very sensitive test (if someone else measures the charge radii).



Measurement to be done

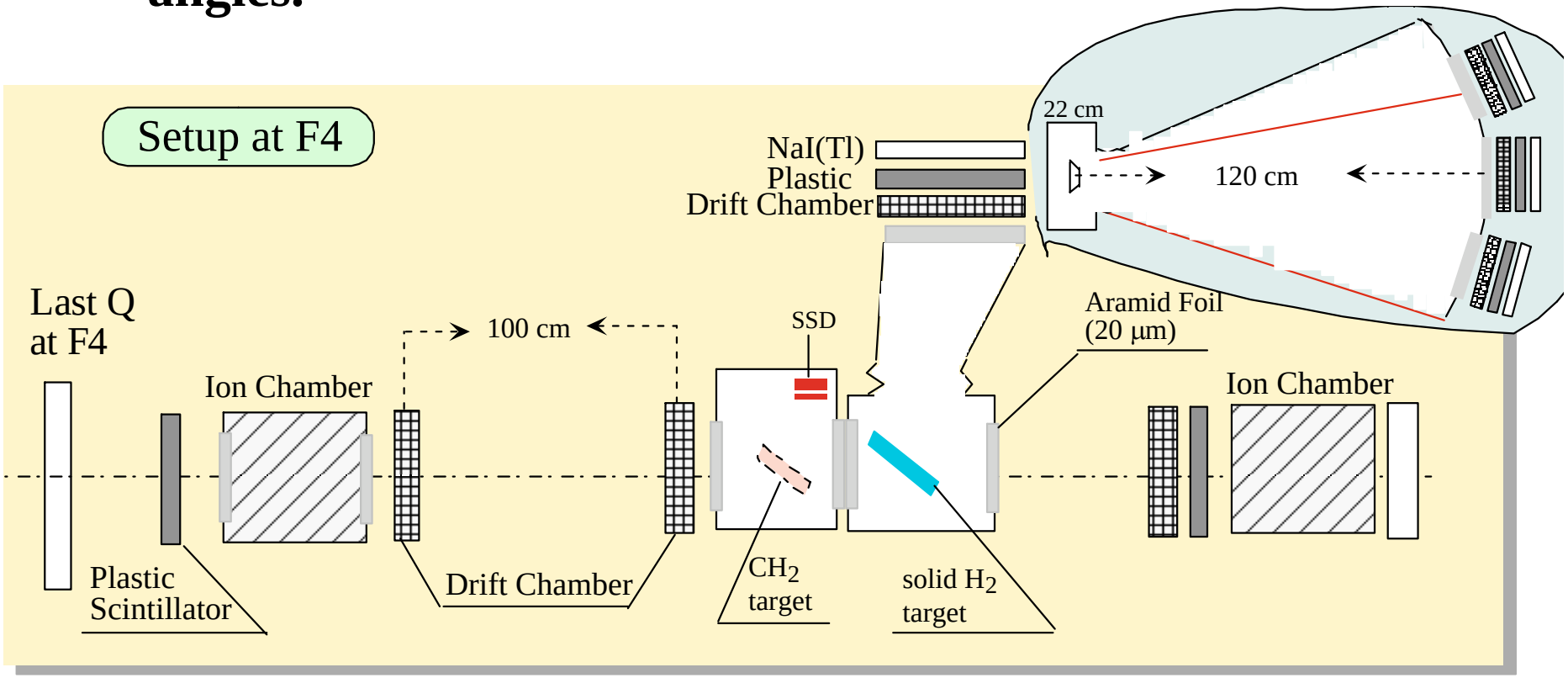
- **Differential cross section of elastic scattering**

Diffraction Pattern

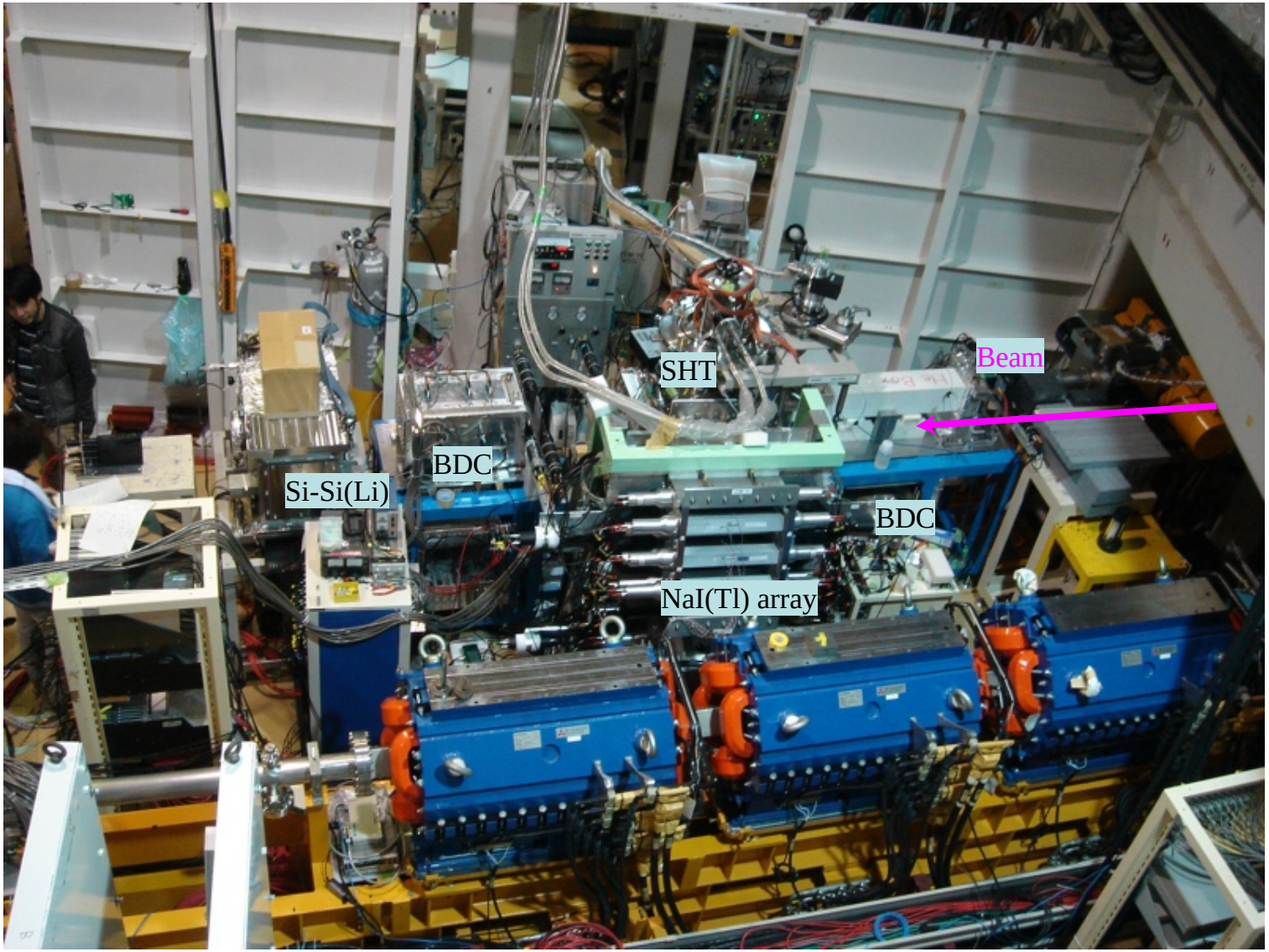


Experimental System

- **We use two targets, one for ~90° proton (small CM angle scattering) and the other for smaller proton angles.**



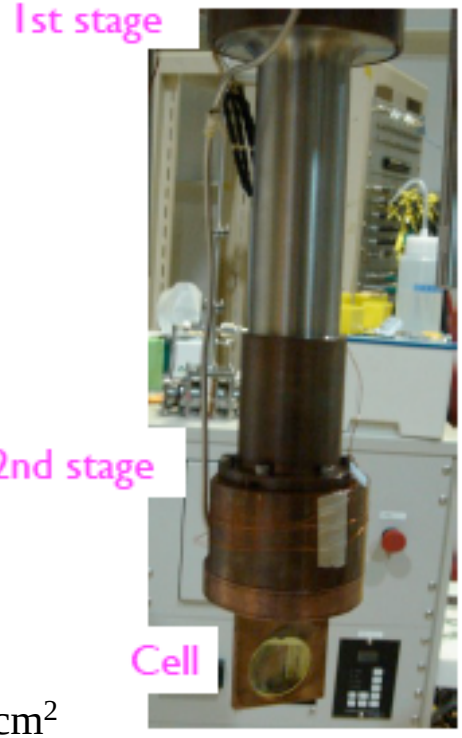
Experimental System (tested at NIRS@Chiba)



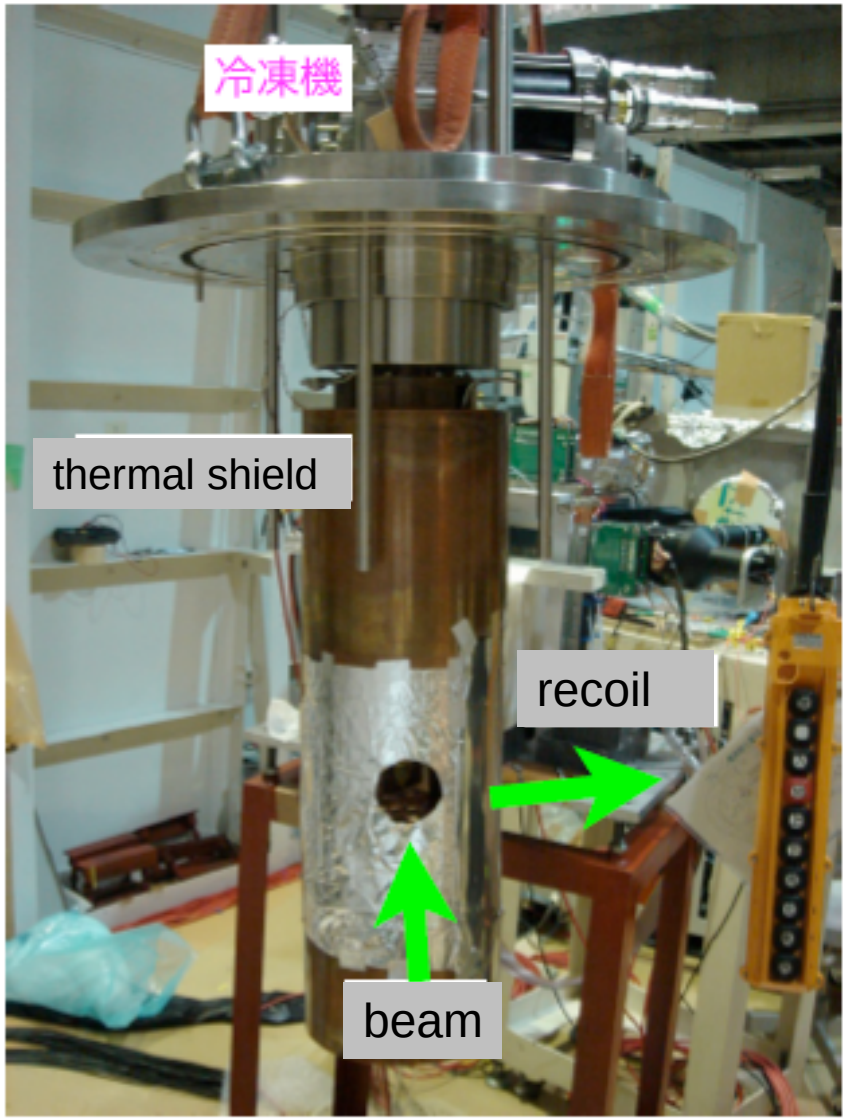
Just photos

Solid hydrogen target (SHT)

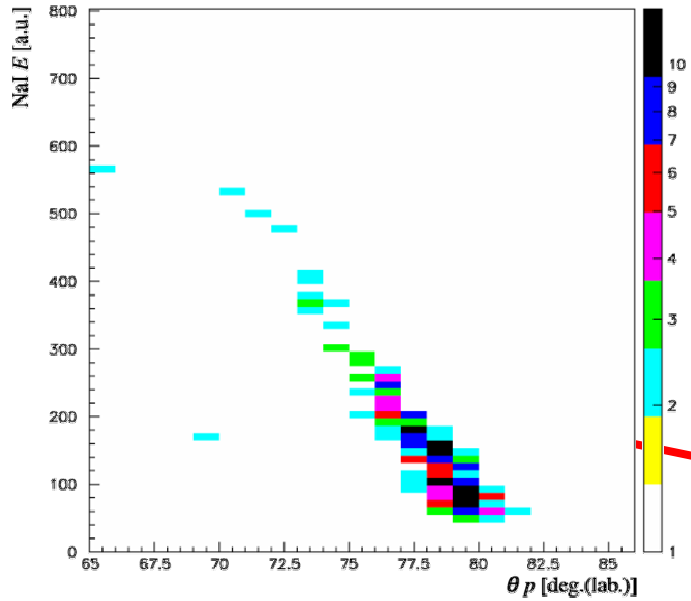
冷凍機	4K 2段式 Gifford McMahon 冷凍機
標的セル	無酸素銅製
セル窓	9 μm Aramid foil (STYCAST1266で接着)
輻射シールド	無酸素銅製
温度計	Pt-Co抵抗温度計

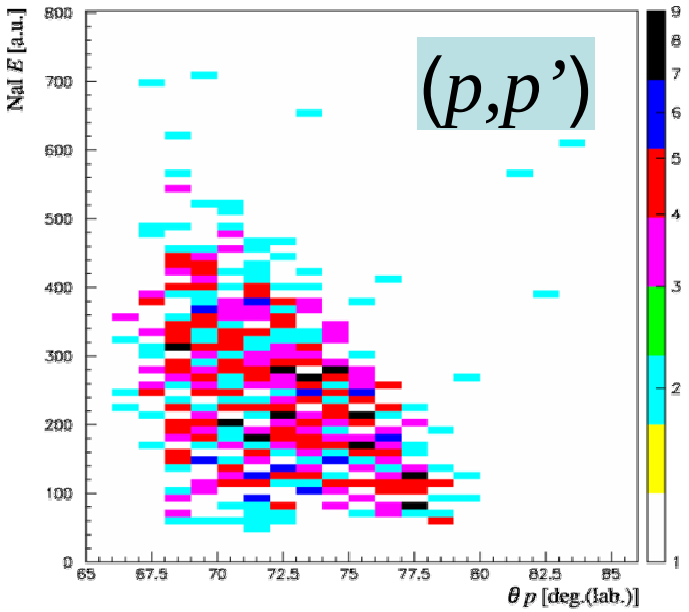


Ø = 35 mm
d = 1 - 5 mm
ρd = 8.8 - 44 mg/cm^2



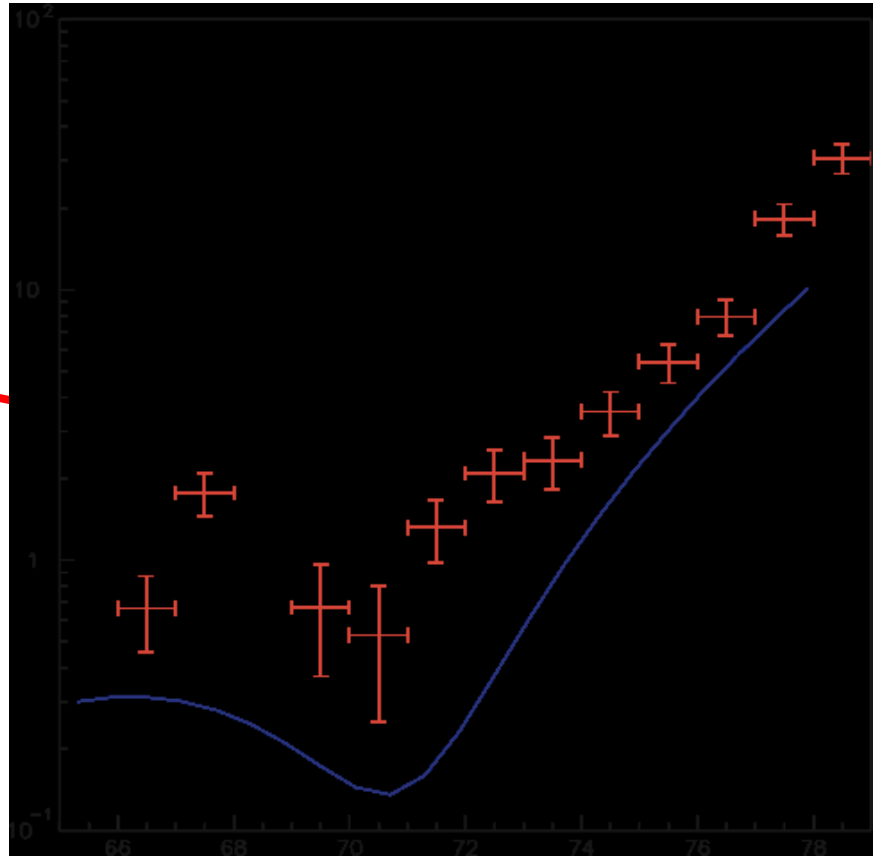
^{9}C preliminary data at Chiba





(p,p')

dσ/dΩ [mb/Sr]



θ$_p$ [deg.(lab.)]

Summary

- **The detector system is ready but we have to transport it to GSI and have to set it up.**
- **It would take two months just for shipping and take several months to set up the system at the location.**
- **We do not have enough electric circuits to keep at GSI for a long time. We would like to borrow standard NIM and CAMAC circuits from GSI as much as possible.**

The Collaboration:

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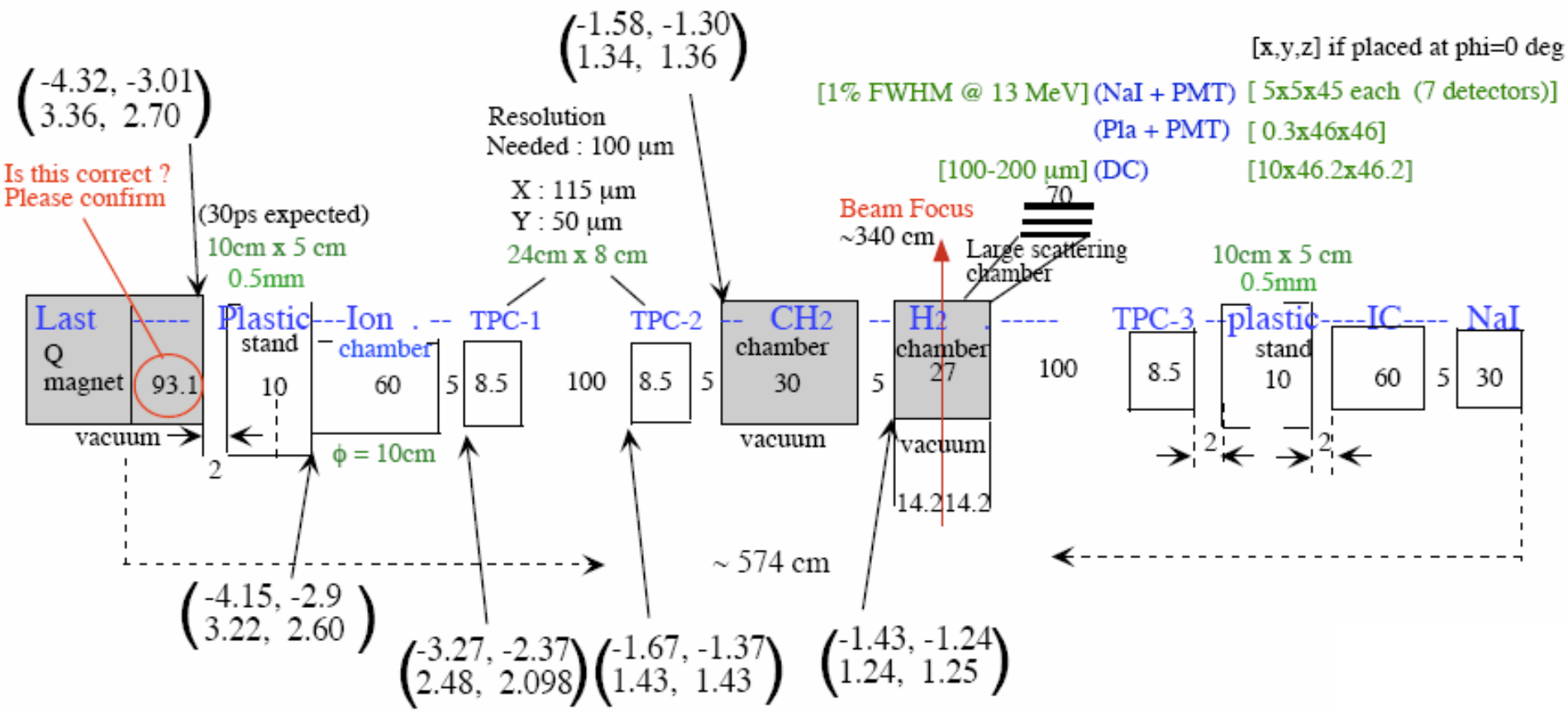
St. Mary U, GSI, U of Bratislava, TU München, KVI

S272: Scheme of S4 setup



Distances and beam sizes [cm]

Beam Size
The ends of a gaussian distribution which are almost zero in linear scale
(Xmin, Ymin
Xmax, Ymax)