

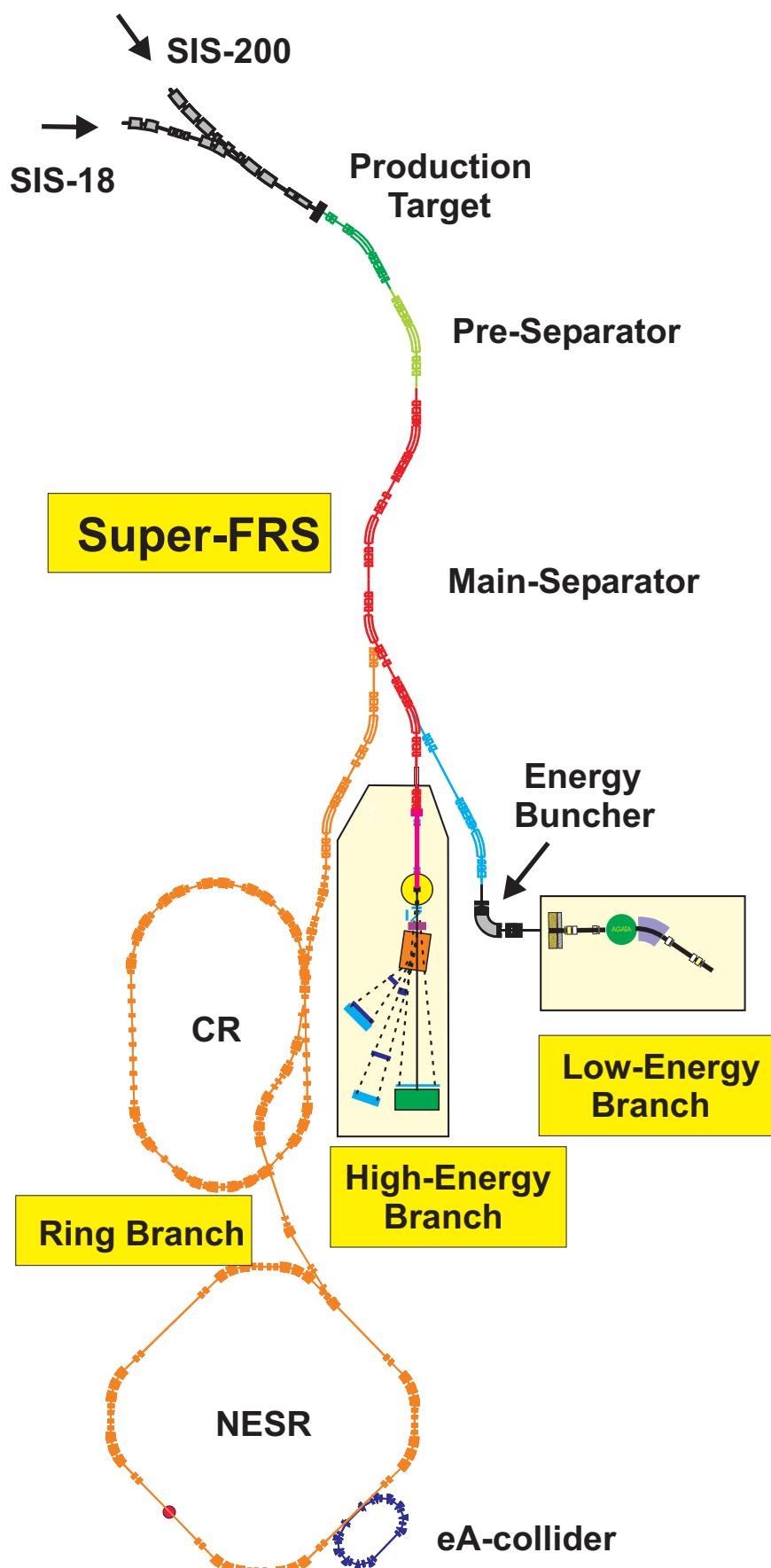
# Experiments at the Low-Energy Branch of the Super-FRS

Christoph Scheidenberger (GSI)  
for the Super-FRS Collaboration

ESR-User Meeting at GSI  
9. December 2002

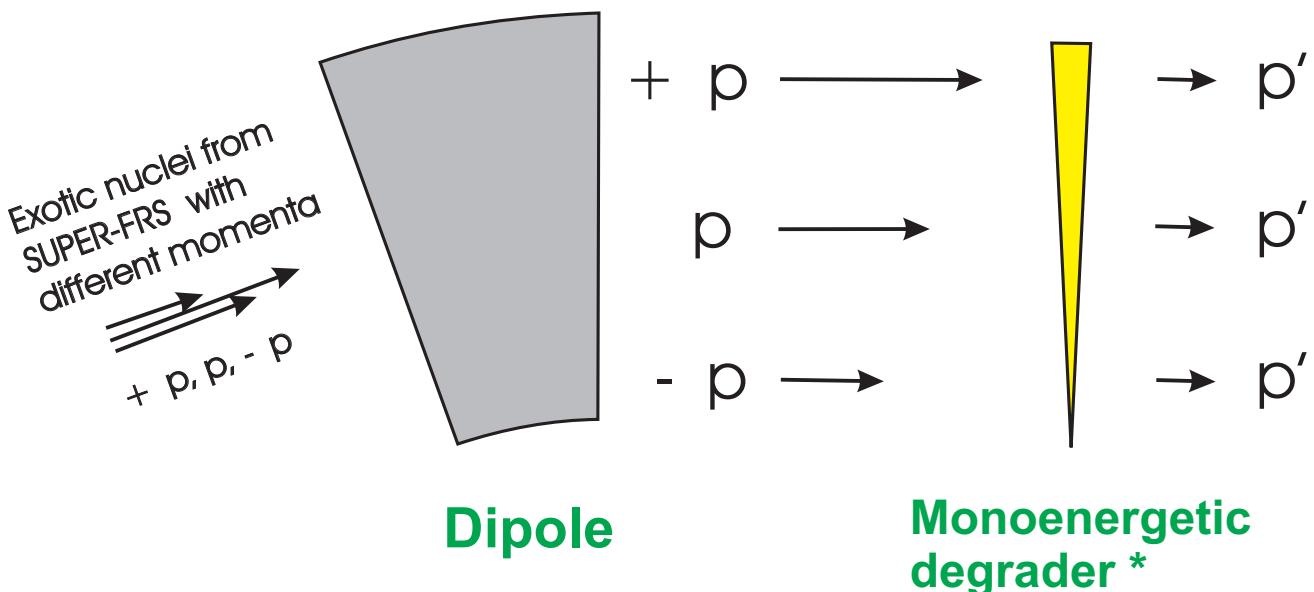
- \* The planned Super-FRS
- \* The Low-Energy Branch.
- \* Motivation for experiments with slow and stopped beams
- \* Experimental opportunities

# The Super-FRS and it's Branches



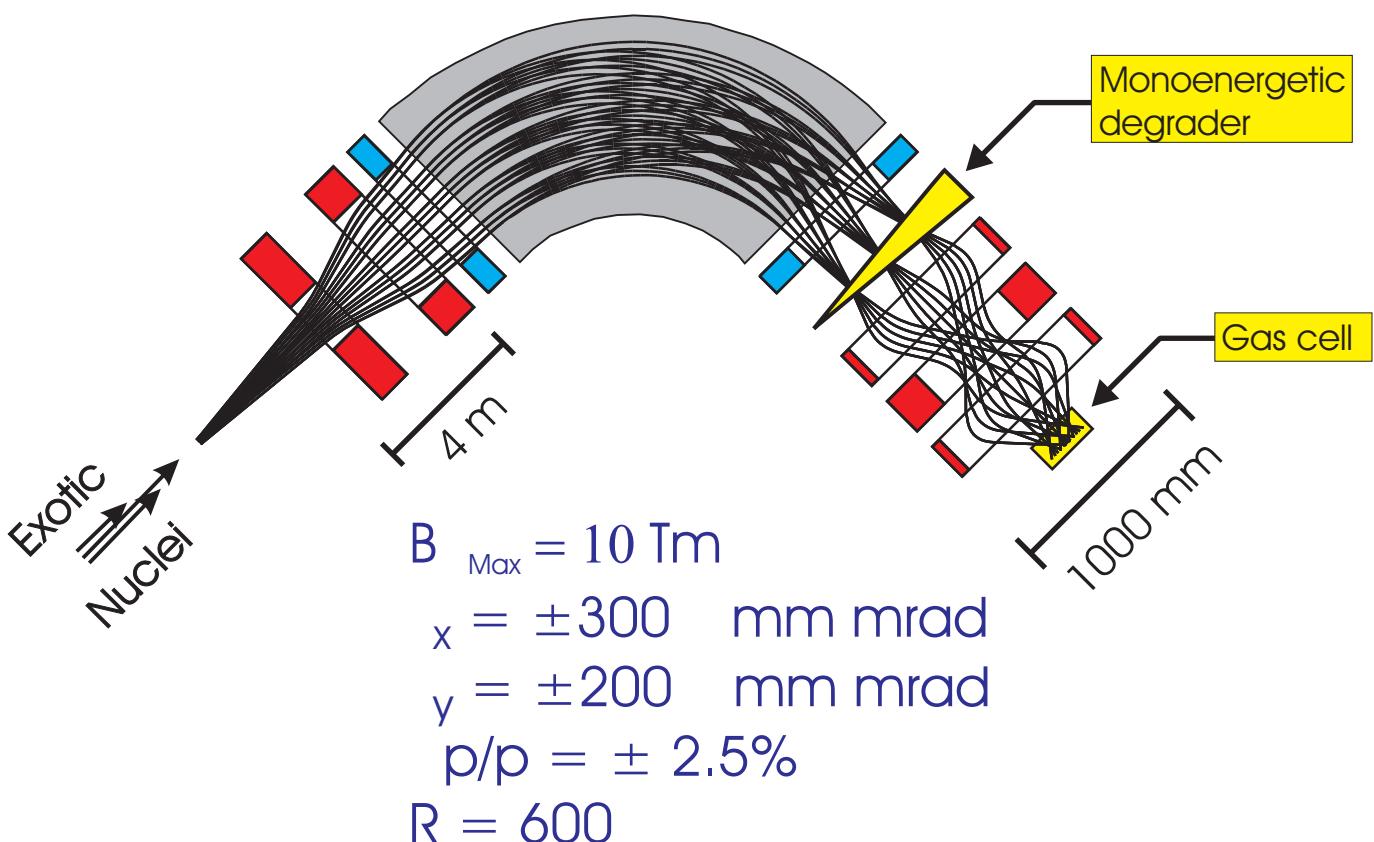
# Energy and range focusing

## Principle



\* H. Geissel et al.,  
NIM A (1989)

## Ion-optical design



# Why slow-down exotic beams?

## -- Motivation --

The combination of fragmentation/fission +  
+ in-flight separation + stopping in gas  
**yields**

low-energy high-quality beams of  
short-lived isotopes of all elements  
**and is**

complementary to existing and future  
ISOL facilities

### Experiments with high quality, low-energy beams:

- \* , , -spectroscopy
- \* LASER spectroscopy
- \* Precision experiments in ion- and atom traps

### Aiming at...

- \* Nuclear structure studies
- \* Tests of SM
- \* Nuclear astrophysics

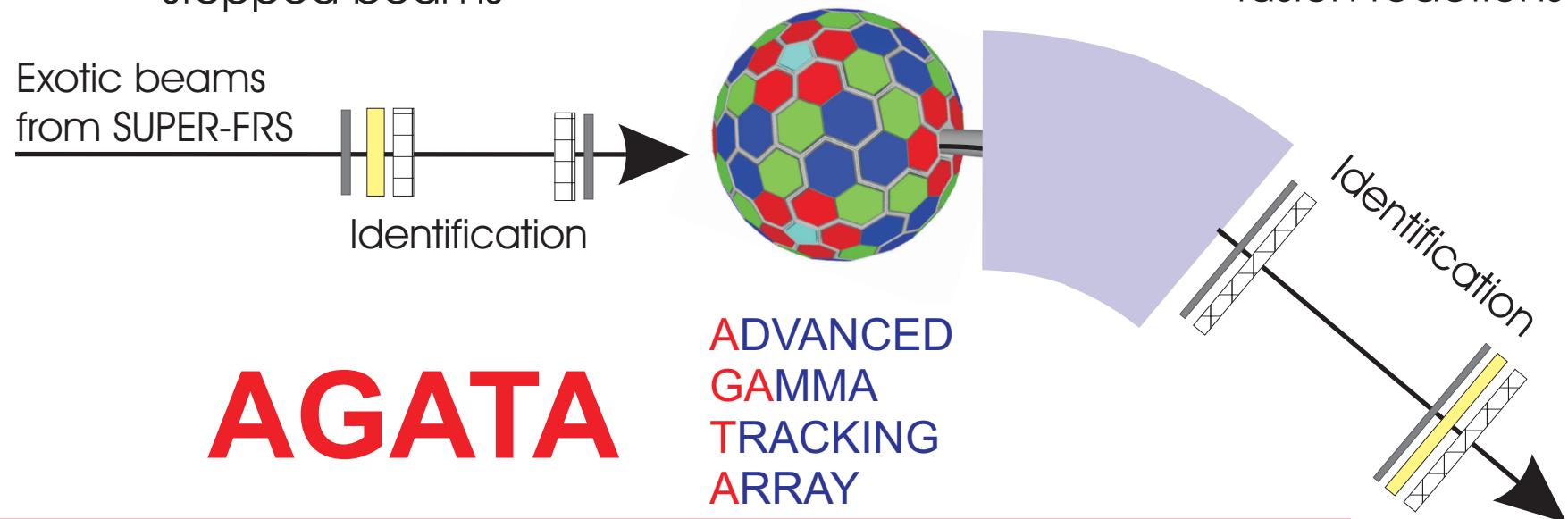
### Physics goals with radioactive beams:

- \* Half-lives, branching-ratios, excitation energies, isomers, deformation, Coulomb excitation,...
- \* Magnetic dipole and electric quadrupole moments, nuclear charge radii
- \* Nuclear binding energies, Q-values, superallowed  $\beta$ -decay, unitarity of CKM-Matrix -correlations (search for scalar weak interact.)

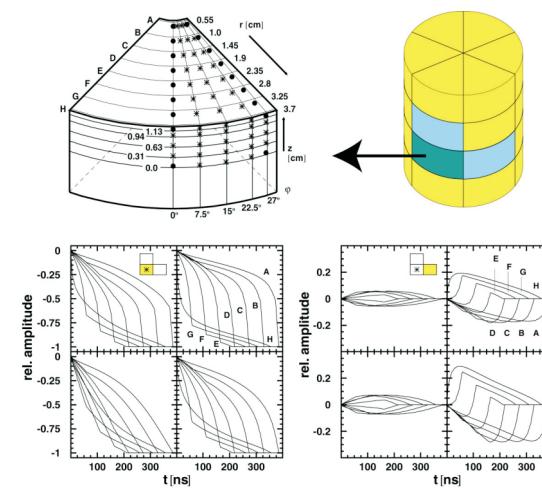
# spectroscopy experiments with slow exotic nuclear beams

Experiments with \* relativistic beams ( $\sim 200\text{MeV/u}$ )  
\* slowed beams (5...20MeV/u)  
\* stopped beams

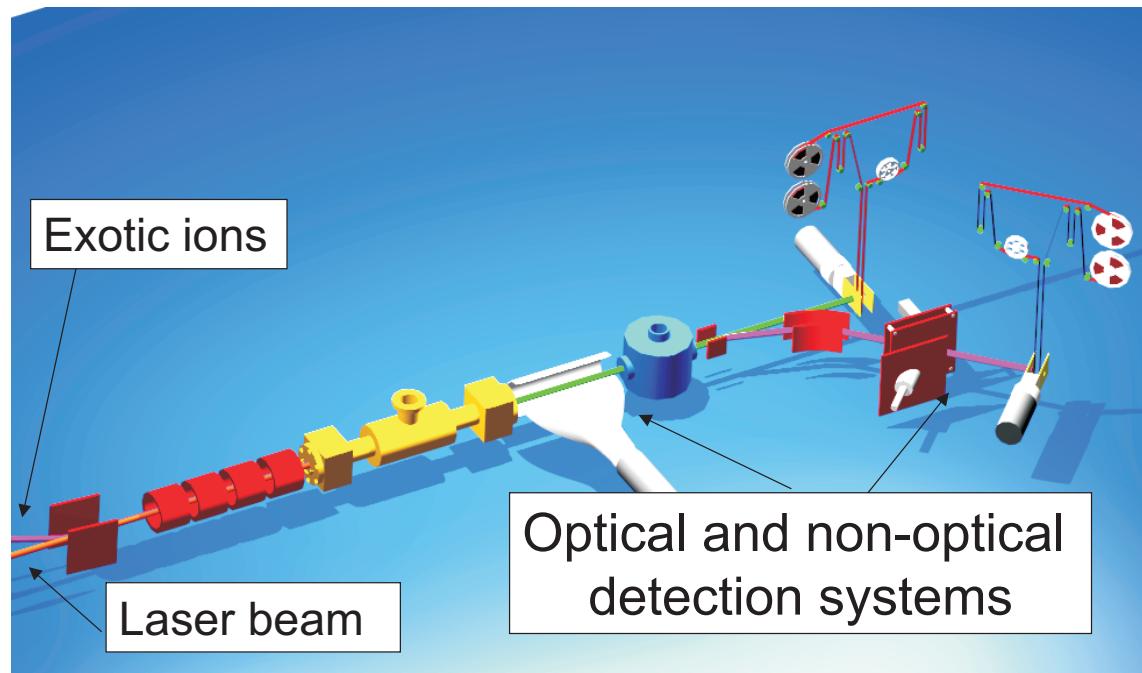
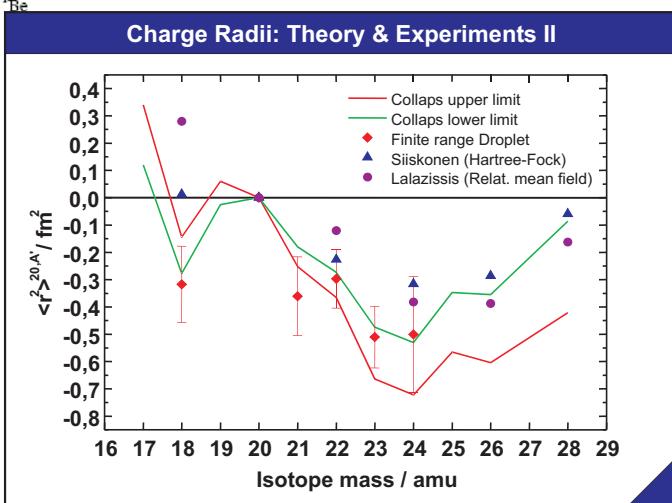
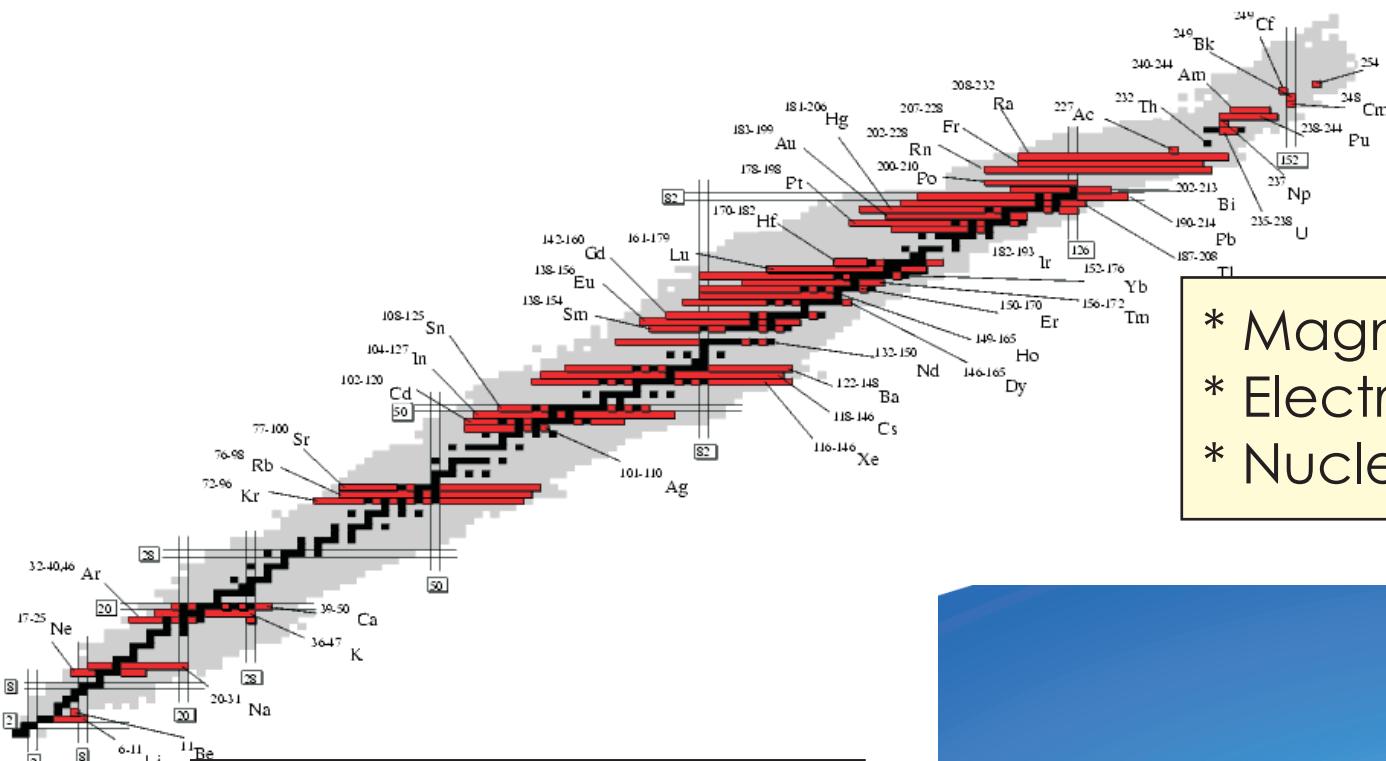
Investigation of \* Coulomb excitation  
\* transfer reactions  
\* fusion reactions



4 segmented Ge detector shell  
17 cm inner radius  
80% Ge solid angle  
12 regular pentagons  
180 irregular hexagons (3 types)



# Collinear LASER spectroscopy

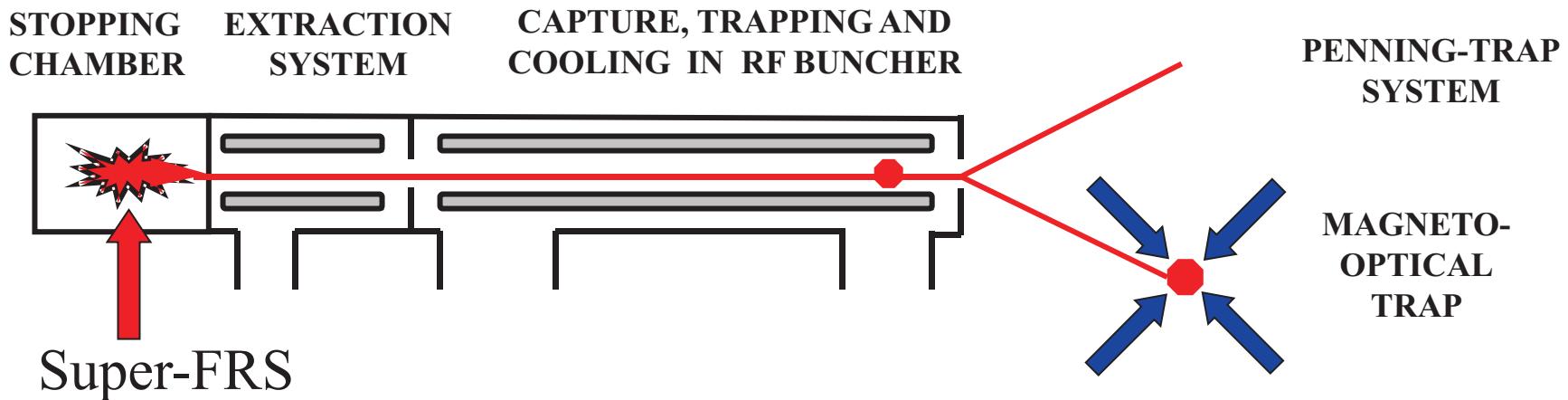


- \* Magnetic dipole moments
- \* Electric quadrupole moments
- \* Nuclear charge radii

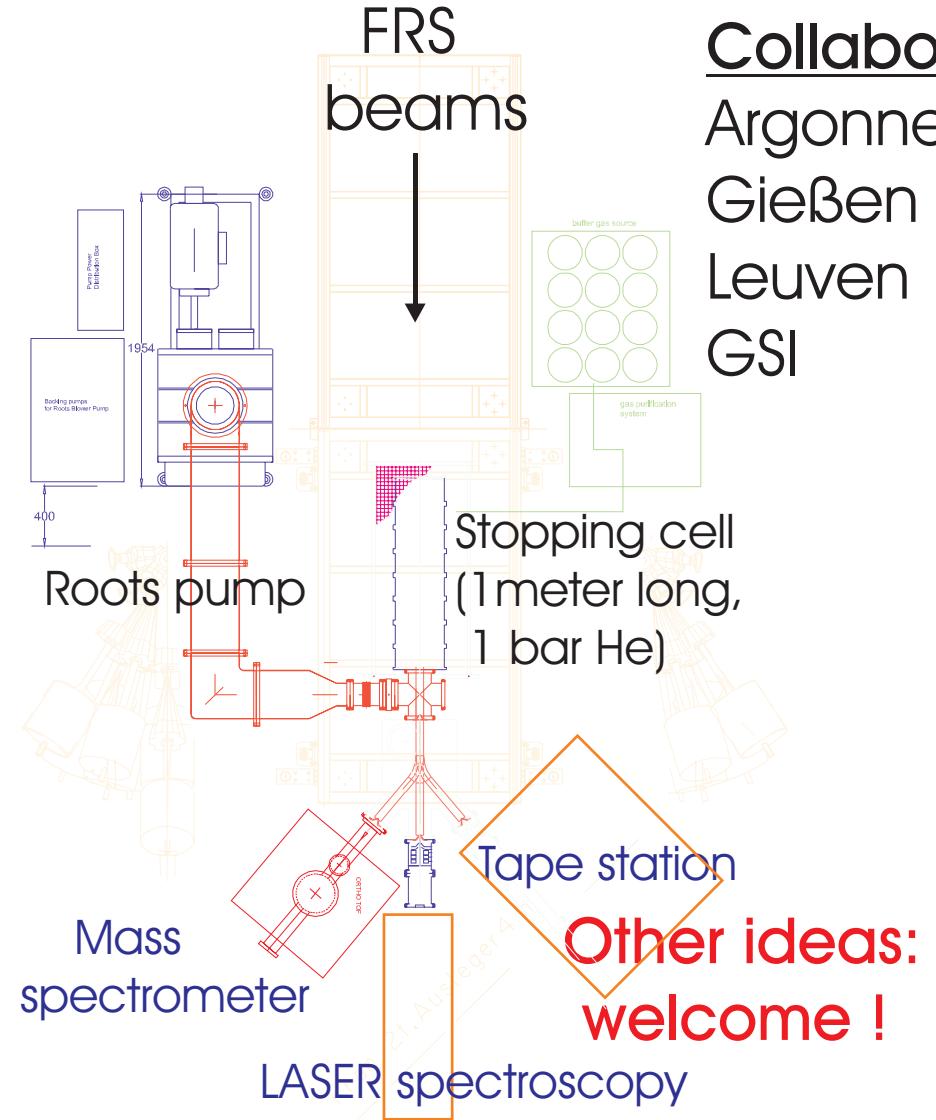
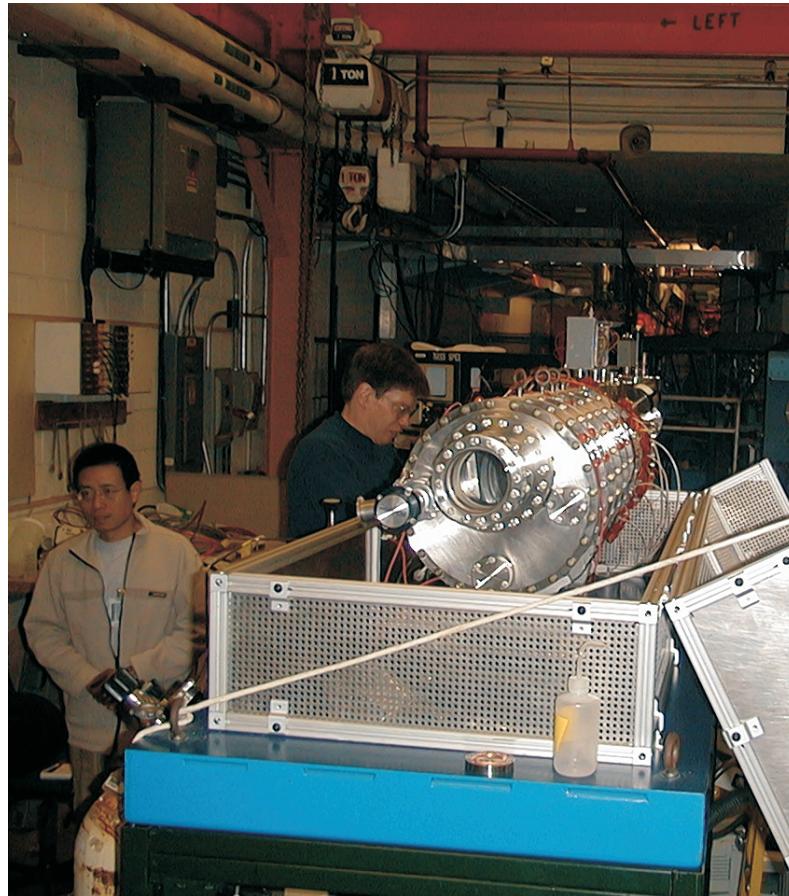
## Experiments in ion and atom traps

- \* Nuclear structure studies
- \* Tests of SM
- \* Nuclear astrophysics

Nuclear binding energies, Q-values,  
superallowed  $\beta$ -decay, unitarity of CKM-Matrix  
-correlations (search for scalar weak interact.)



# FRS Ion-Catcher Setup\*: a study for the LEB of the Super-FRS



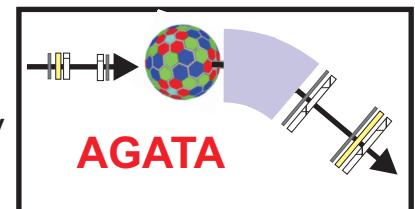
**Collaboration:**  
Argonne ANL  
Gießen Univ.  
Leuven  
GSI

\* Part of the European RTD Network "ION CATCHER"

# Super-FRS + LEB: probing new fields

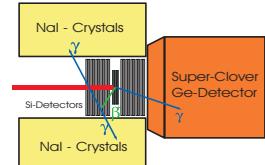
... with swift monoenergetic exotic beams:

in-beam  $\gamma$ -ray  
spectroscopy

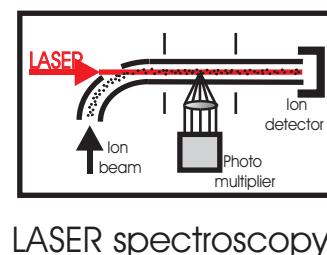


... with beams stopped in thin absorbers:

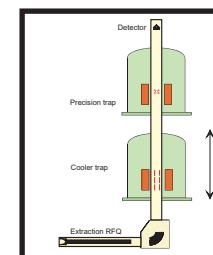
, , decay  
spectroscopy



... with ISOL-type beams:



LASER spectroscopy



Precision ex-  
periments  
in ion and  
atom traps

\* New ideas welcome!

\* Mid of 2003: Workshop on the physics potential and possible experiments at the LEB

\* Your contribution is most welcome!

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