

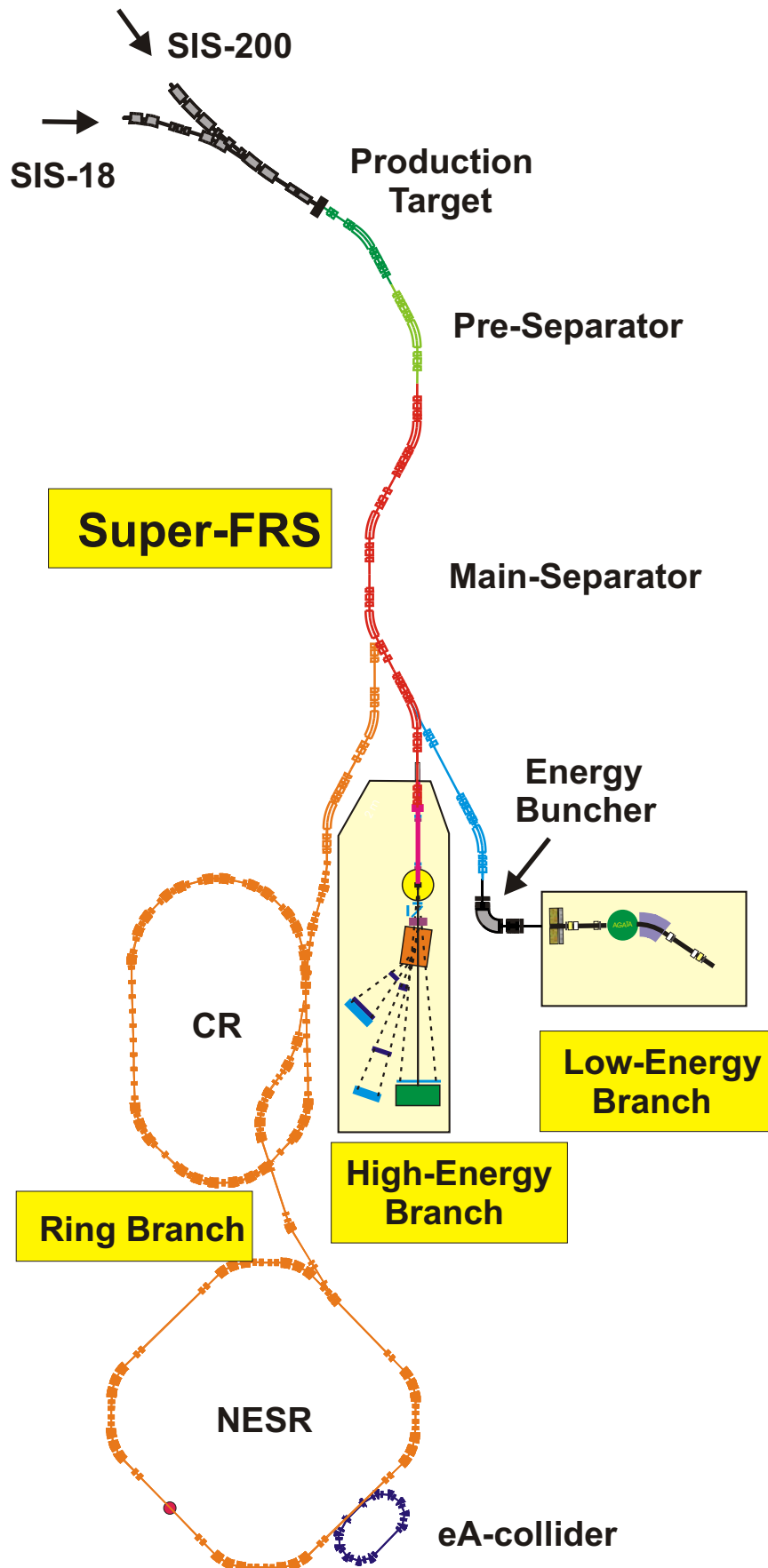
Experiments at the Low-Energy Branch of the Super-FRS

Christoph Scheidenberger (GSI)
for the Super-FRS Collaboration

FRS-User Meeting at GSI
12.-14. February 2003

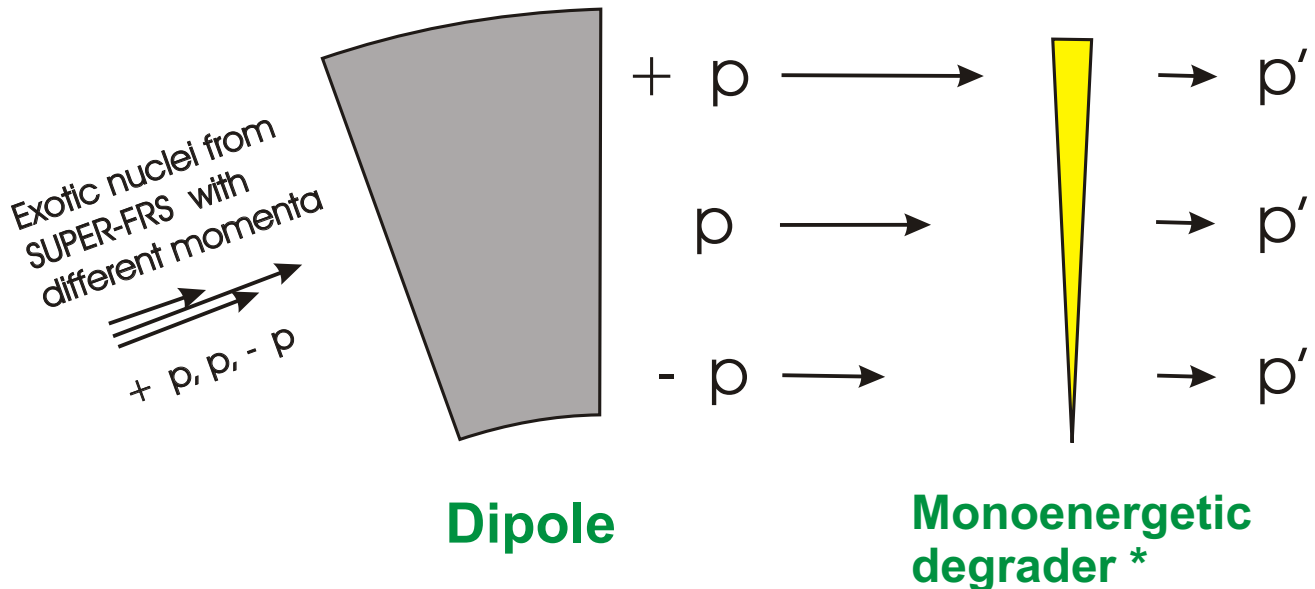
- * The planned Super-FRS
- * The Low-Energy Branch
- * Motivation for experiments with slow and stopped beams
- * Experimental opportunities

The Super-FRS and its Branches



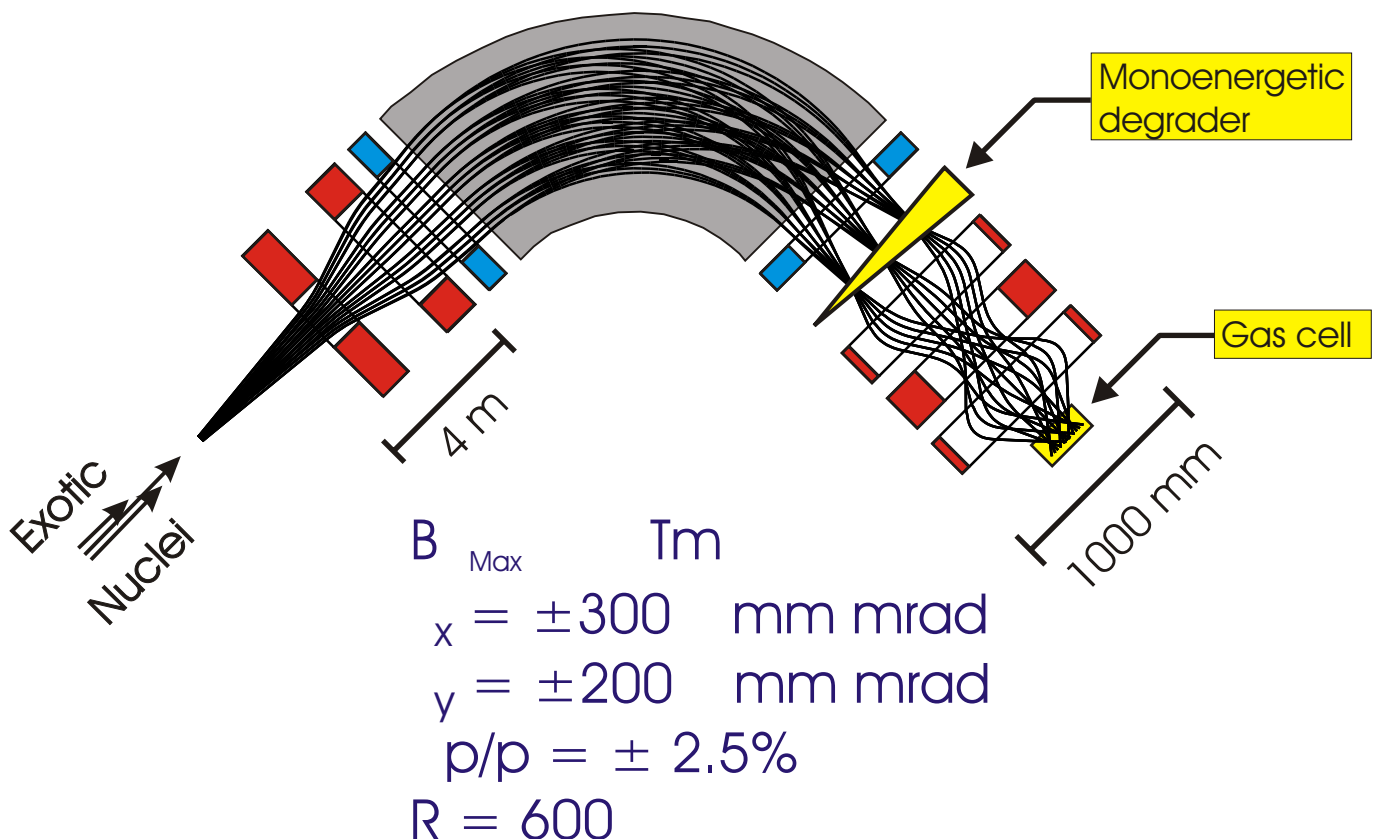
Energy and range focusing

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 β^- -decay, unitarity of CKM-Matrix correlations (search for scalar weak interact.)

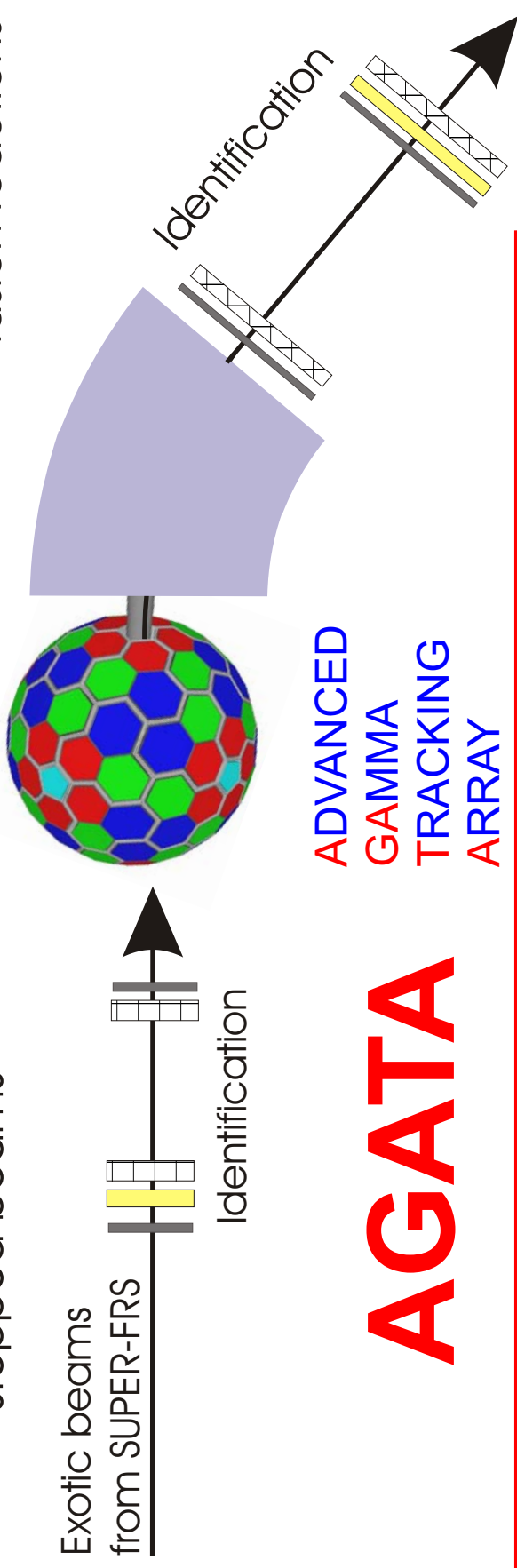
Gamma-spectroscopy experiments with slow exotic nuclear beams

Experiments with

- * relativistic beams ($\sim 200 \text{ MeV/u}$)
- * slowed beams ($5 \dots 20 \text{ MeV/u}$)
- * stopped beams

Investigation of

- * Coulomb excitation
- * transfer reactions
- * fusion reactions



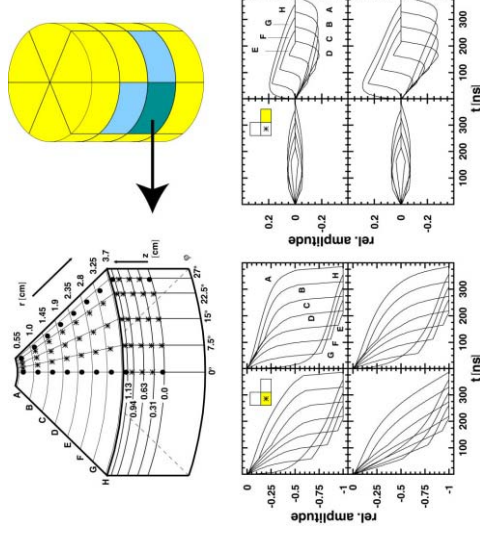
4 segmented Ge detector shell

17 cm inner radius

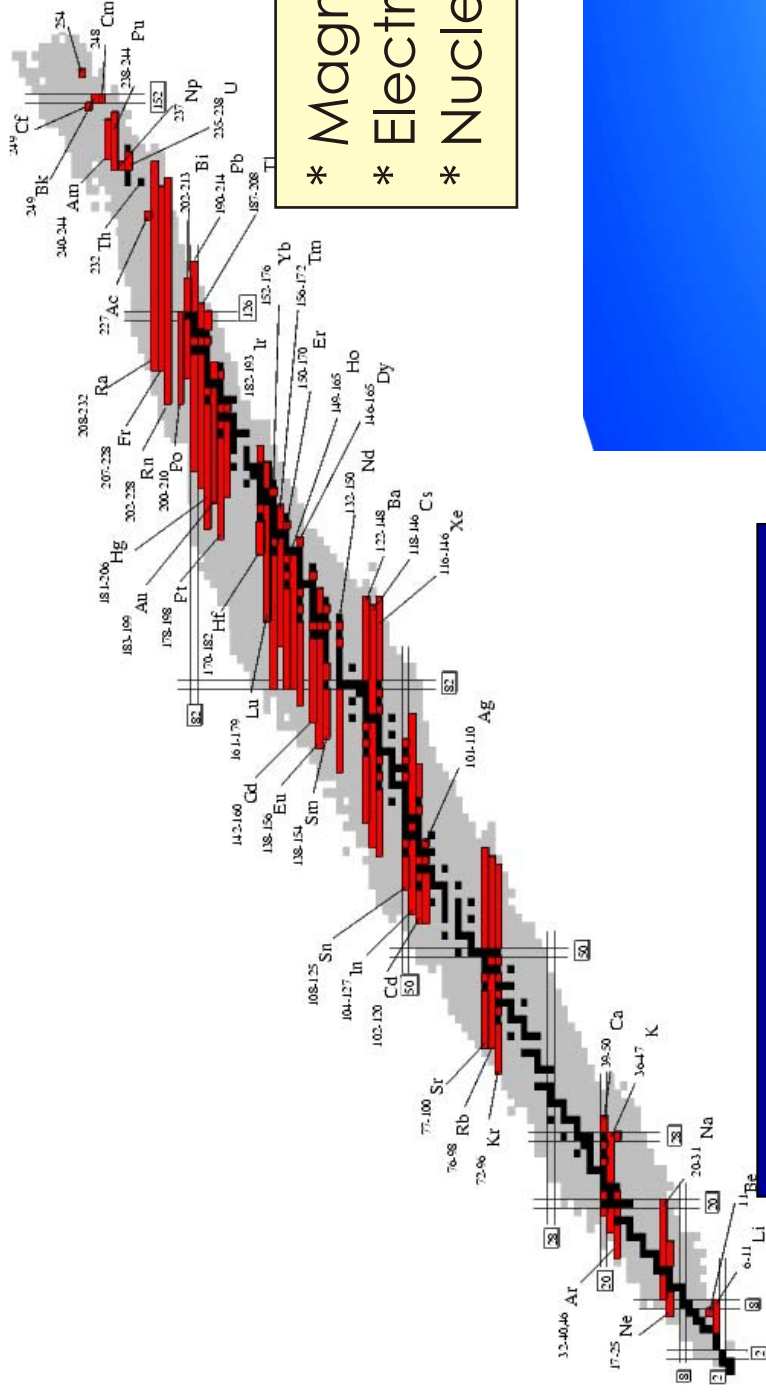
80% Ge solid angle

12 regular pentagons

180 irregular hexagons (3 types)

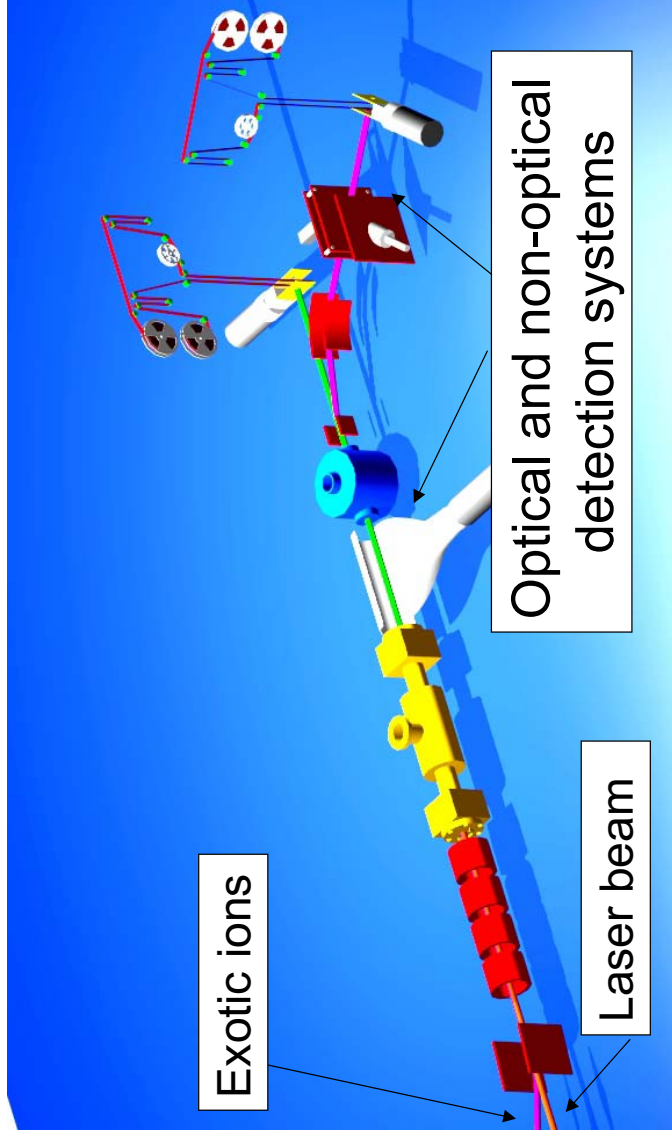
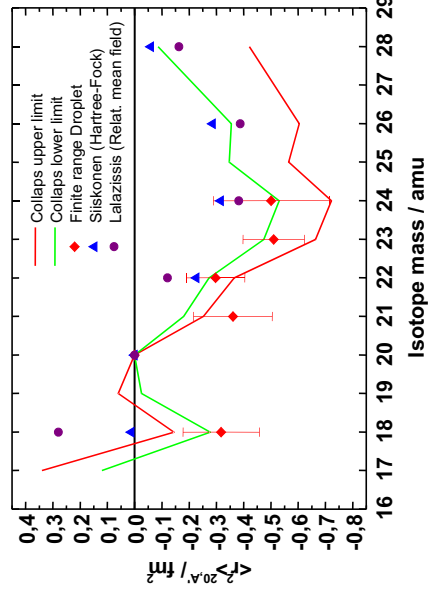


Collinear LASER spectroscopy



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

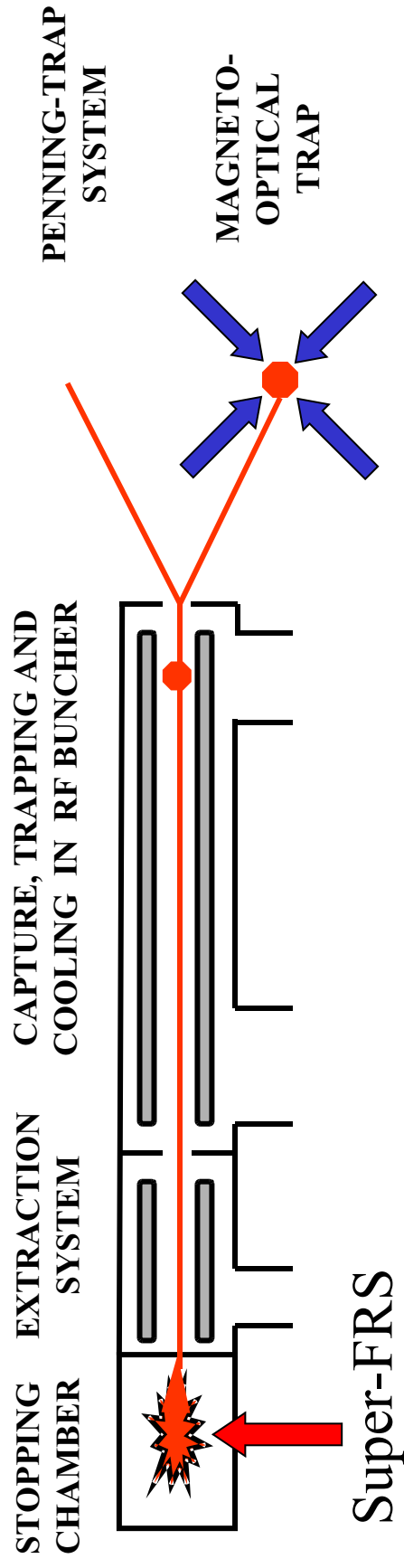
Charge Radii: Theory & Experiments II



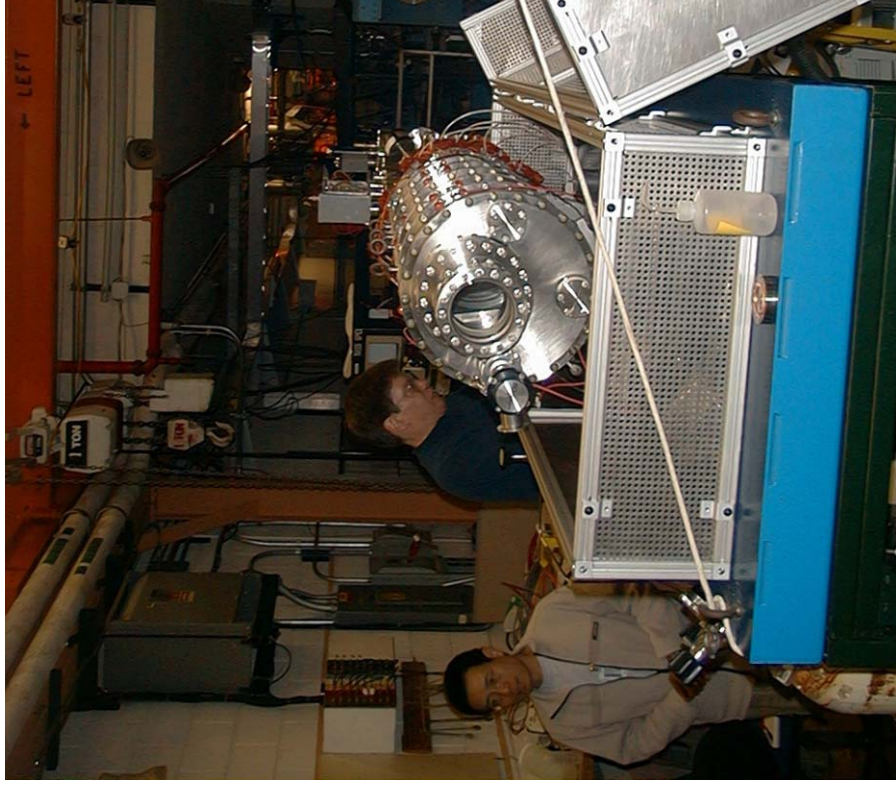
Experiments in ion and atom traps

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

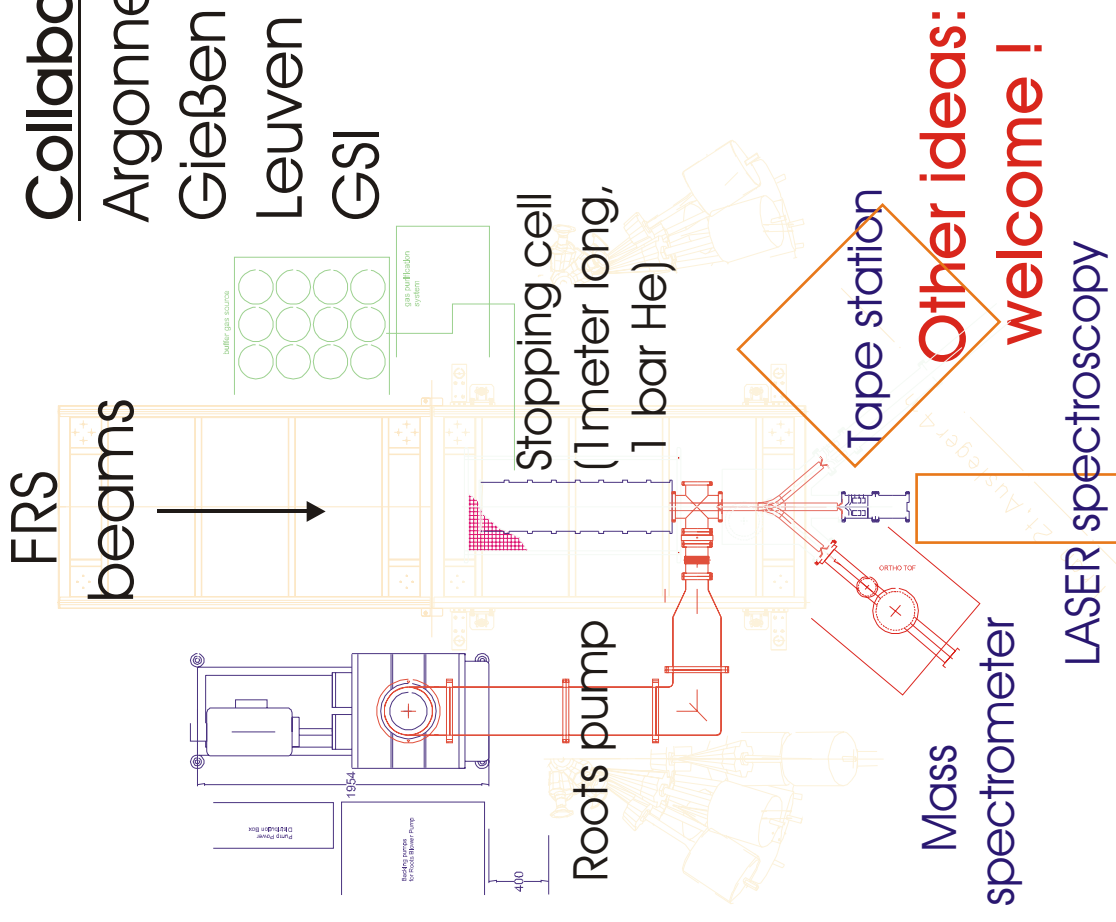
Nuclear binding energies, Q-values,
 superallowed β -decay, unitarity of CKM-Matrix
 -correlations (search for scalar weak interact.)



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



Collaboration:
Argonne ANL
Gießen Univ.
Leuven
GSI

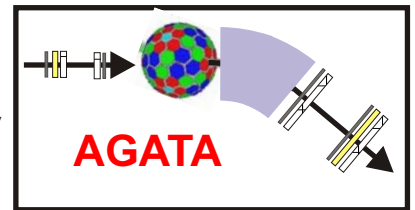


* Part of the European RTD Network "ION CATCHER"

Super-FRS + LEB: probing new fields

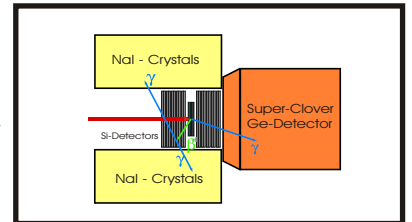
... with swift monoenergetic exotic beams:

in-beam γ -ray
spectroscopy

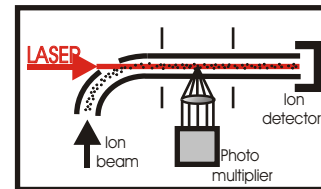


... with beams stopped in thin absorbers:

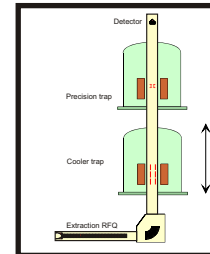
decay
spectroscopy



... 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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