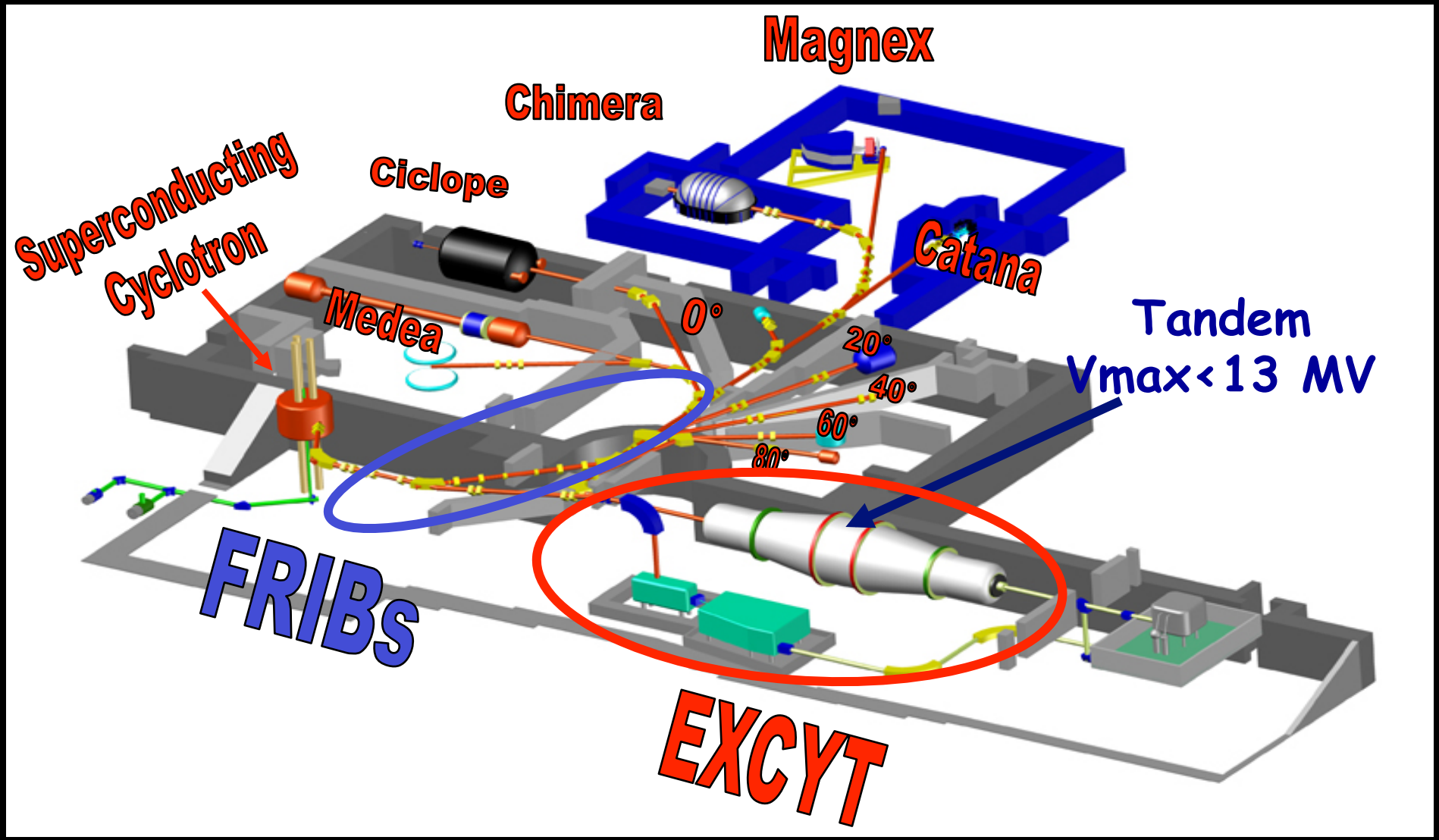
LNS in numbers

INFN - Laboratori Nazionali del Sud are located in the Catania University campus area

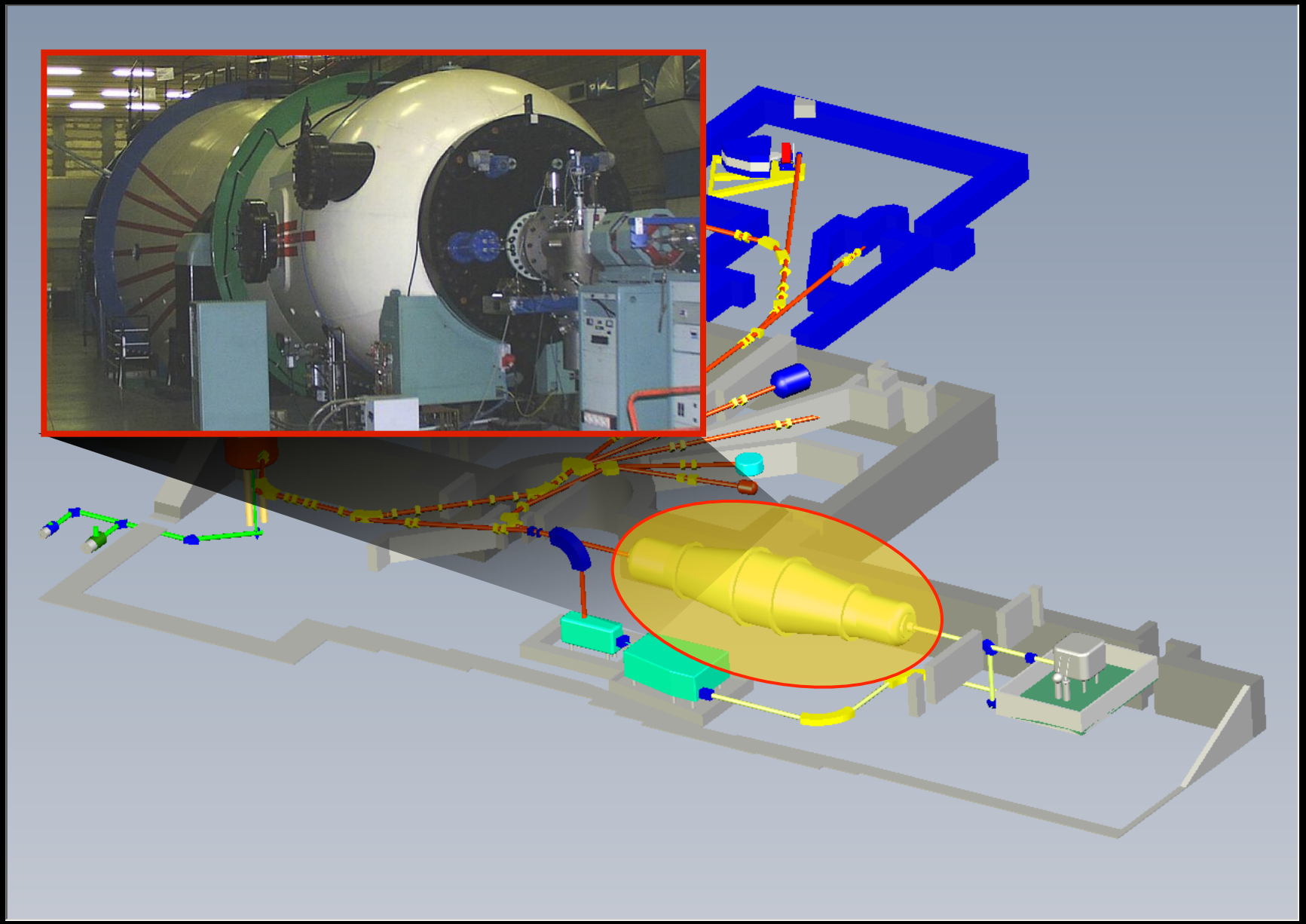
- Staff members: 120 (35 phys. + eng.)
- Associated researchers: 39
- Users (in the last 3 years): 545
- Foreign users: 180
- Annual scientific production: about 150 (papers and proceedings)
- Budget: ~ 9 M€/year (excl. Salaries)

- *Total area: 35000 m^2*
- *Total volume: 97000 m^3*

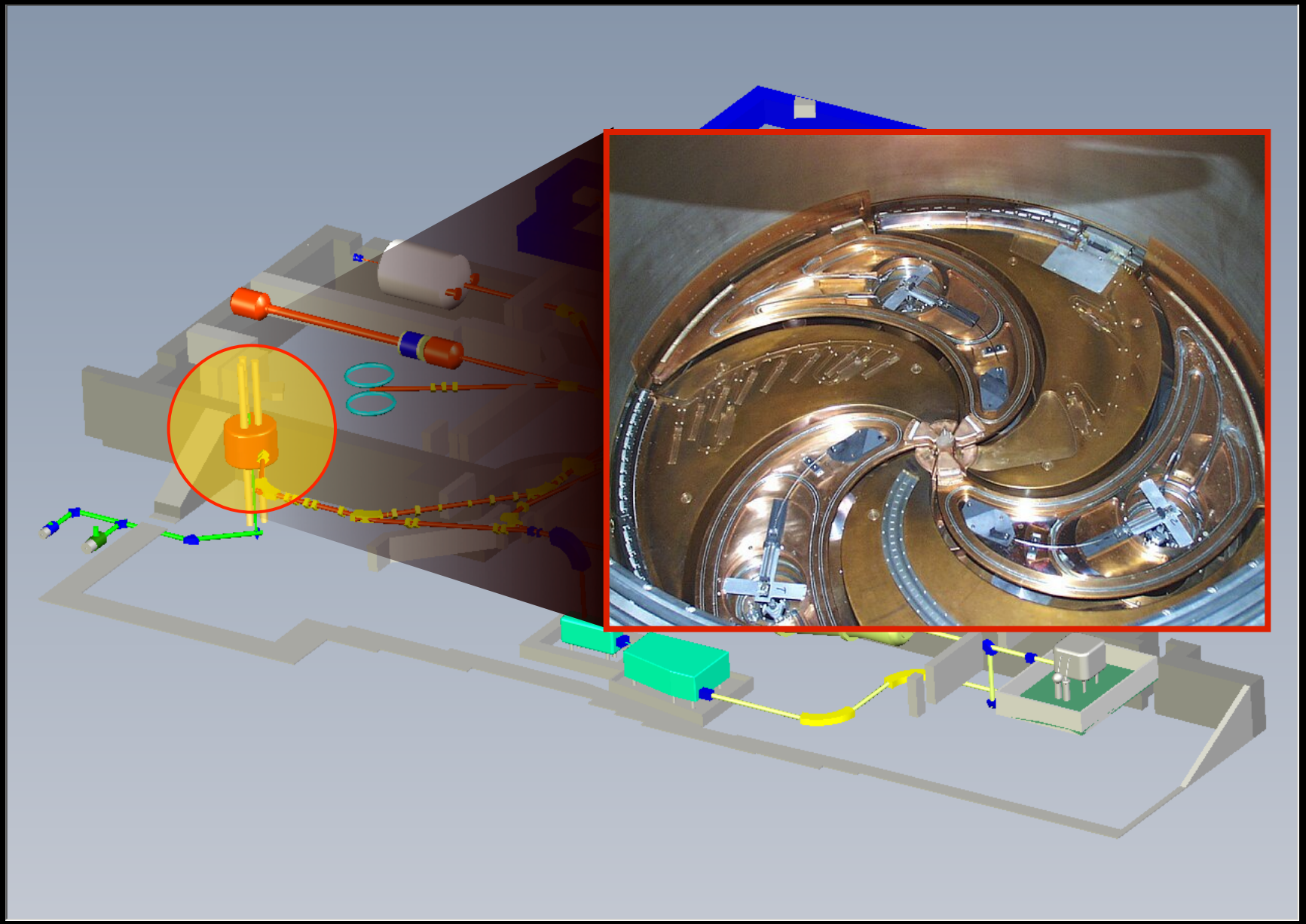
Cyclotron is used to deliver stable ion beams but also as driver for production of radioactive beams. Both ISOL and IFF methods being exploited



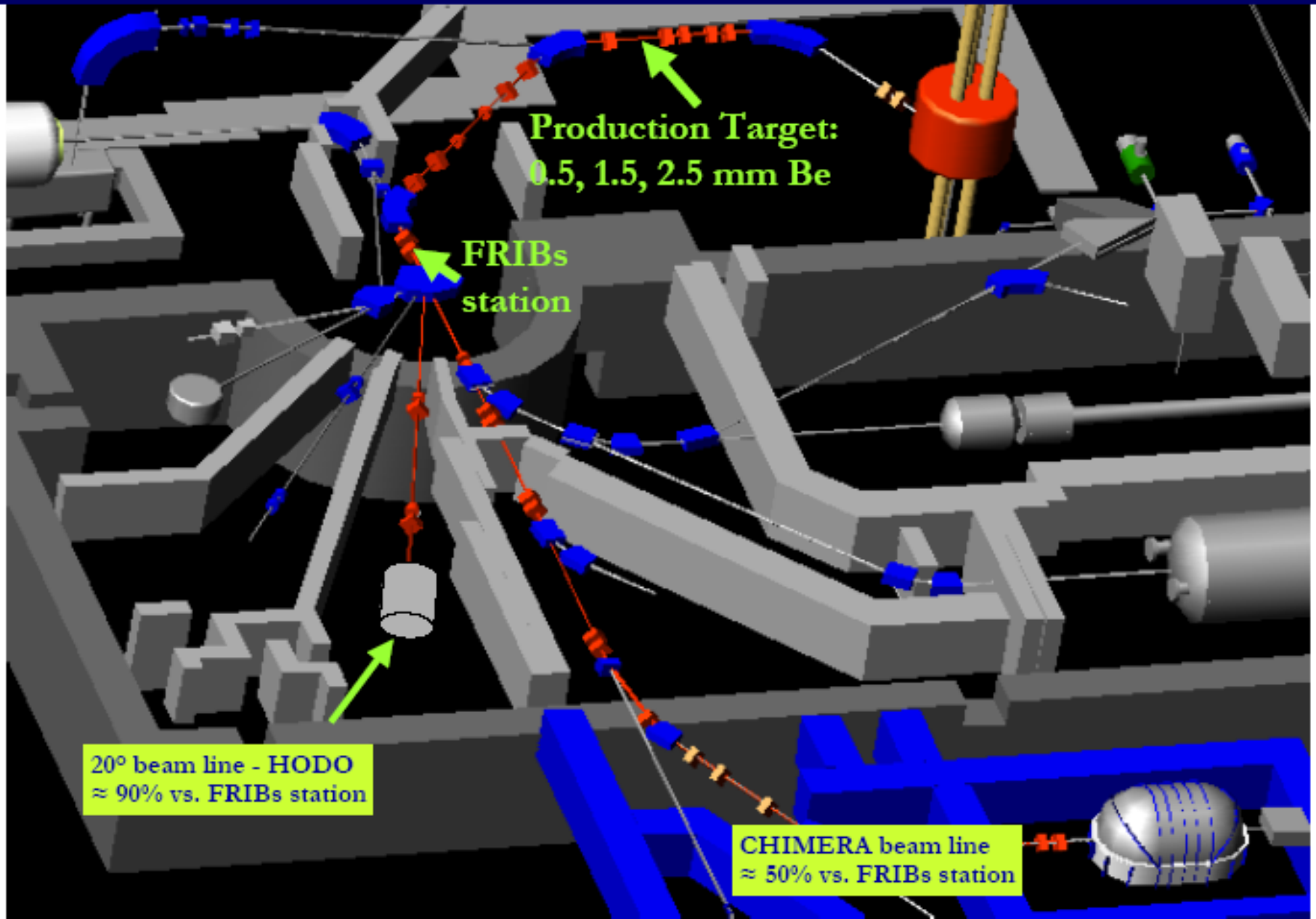
Tandem



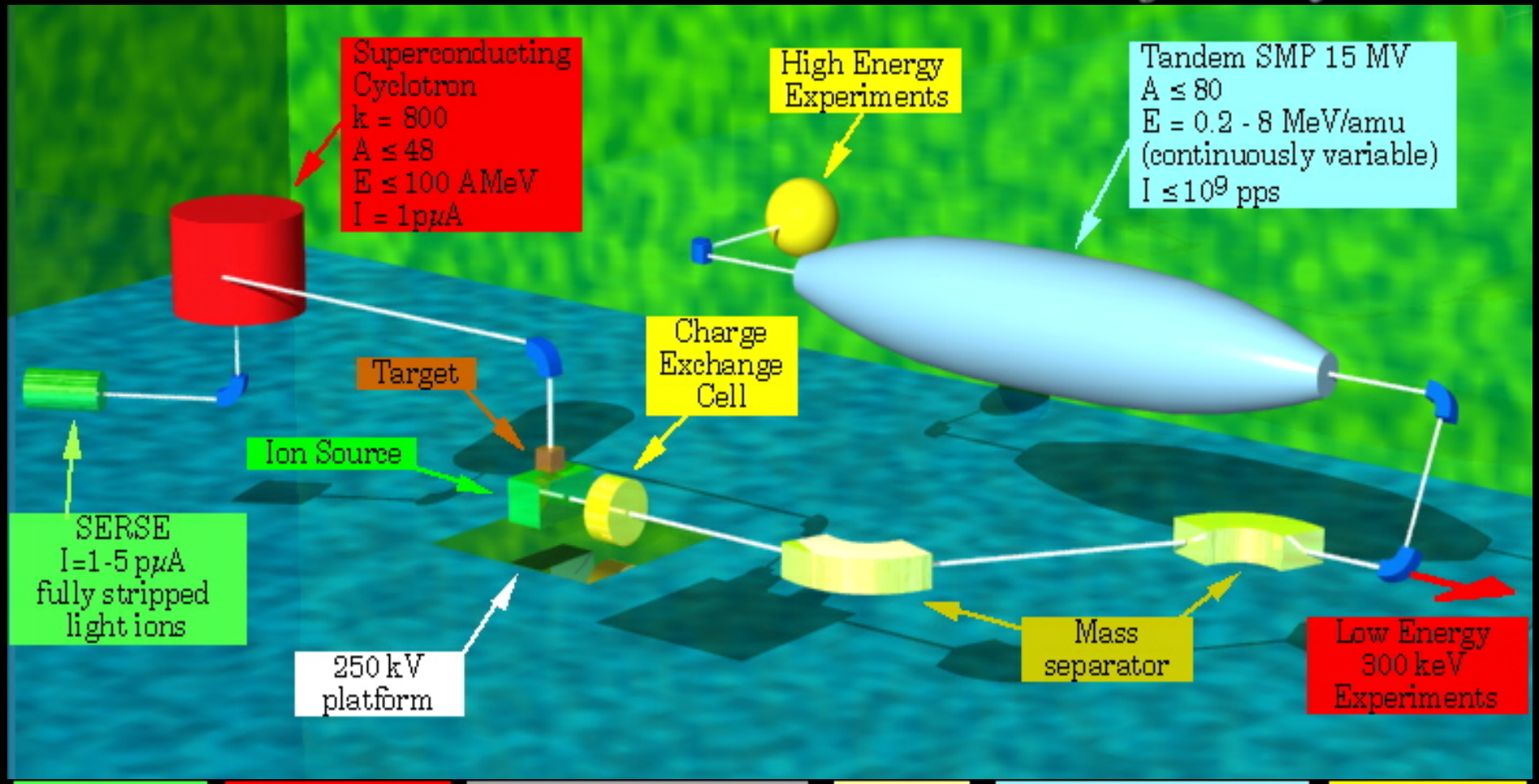
K-800 Superconducting Cyclotron

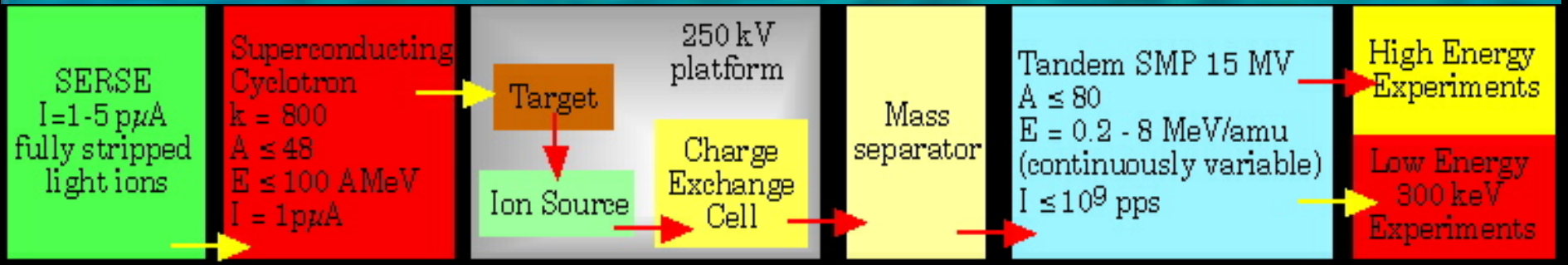


FRIBS@LNS: in Flight Radioactive Ion Beams



The EXCYT radioactive beam facility





Main LNS experimental apparata for Nuclear Physics

MAGNEX

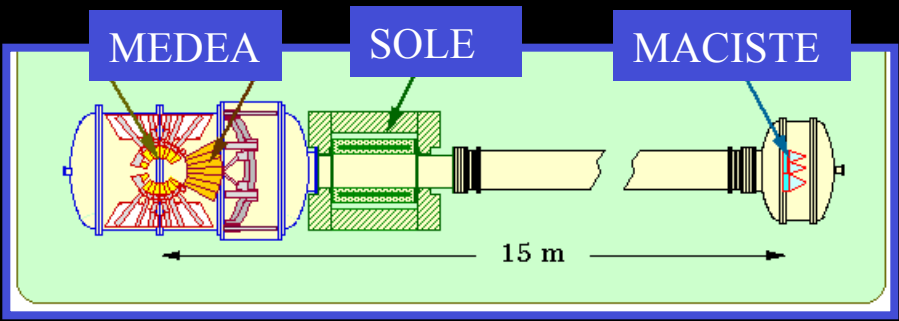
- Light nuclei structure
- Nuclear astrophysics
- Spectroscopy
- Structure effects on reaction mechanism

CHIMERA

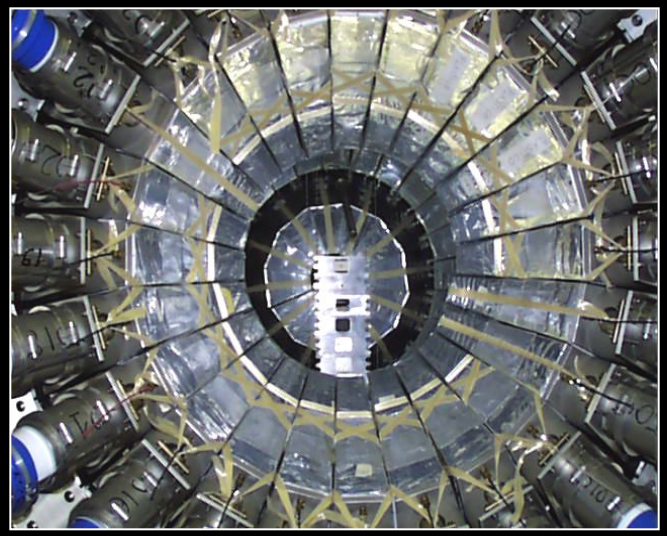
- GDR
- Caloric curve & phase transition
- Multifragmentation
- Isospin dependence of EoS
- Di-proton decay

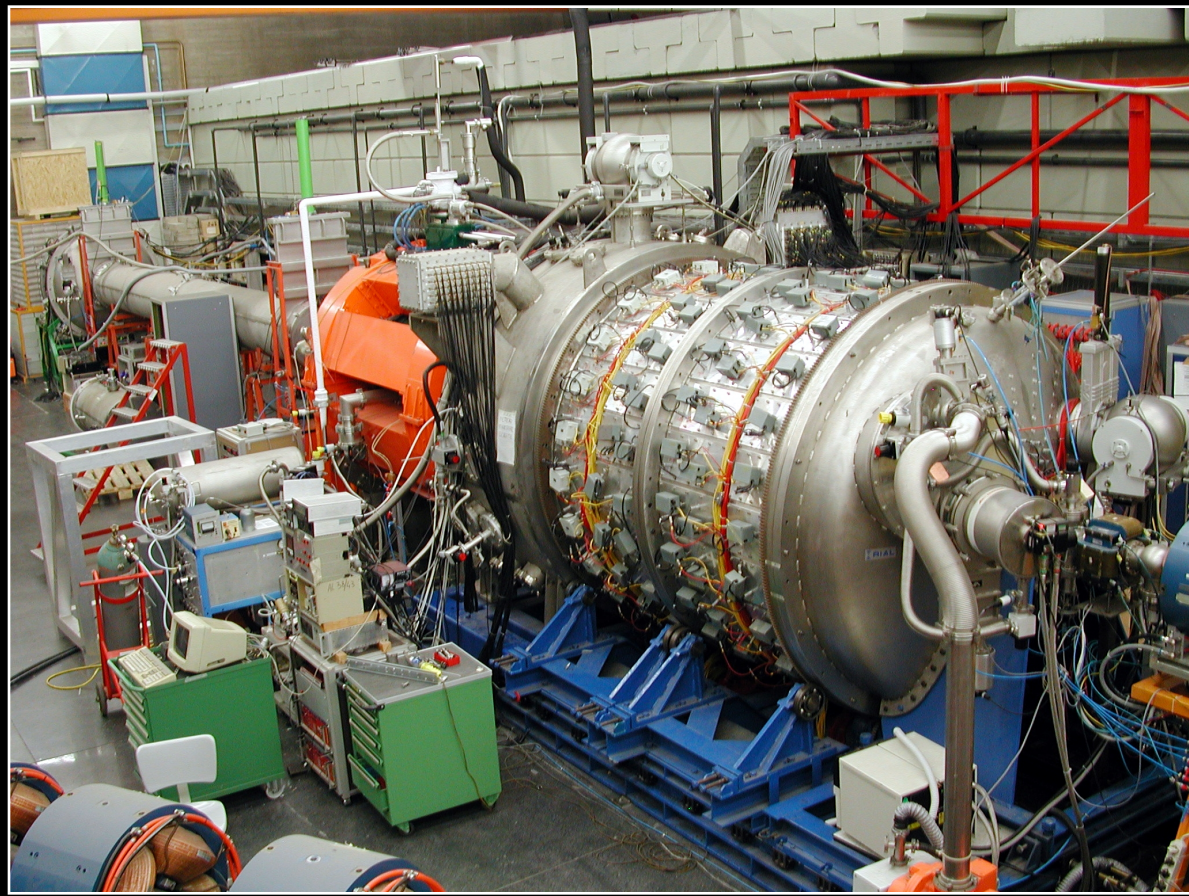
2011: ENSAR Transnational access

MEDEA - SOLE - MACISTE



- MEDEA: 180 20 cm thick BaF_2 modules
- SOLE: Superconducting solenoid to collect forward products
- MACISTE: 8 gas-plastic position sensitive telescopes





List of other activities @ LNS:

- Nuclear Physics measurements at low energy using the so called Trojan Horse, measures relevant for astrophysical models;
- The Km^3-net neutrino telescope;
- Experimental activities in the field of Cultural Heritage;
- Laser plasma acceleration methods ;
- Detectors development;
- Radiobiology measures;
- Ions induced damage on electronic devices (private companies);

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High energy astrophysics

NEMO

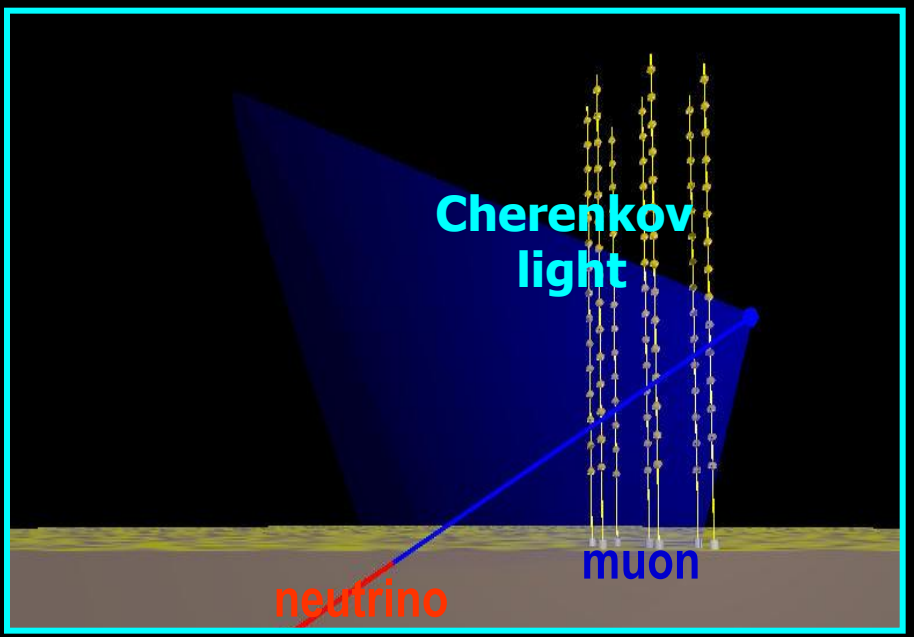
interstellar radiation and matter

neutrinos

protons

far cosmic "accelerator" (particle energy>10^{17}eV)

electromagnetic radiation (radio, light, UV, X, gamma)



Optical modules

"Submarine Telescope" for very high energy neutrinos.

It will allow to explore regions and phenomena in the Universe never observed so far

Neutrino observatory project at LNS

LANDIS

The laboratory of non destructive analysis of the LNS/INFN

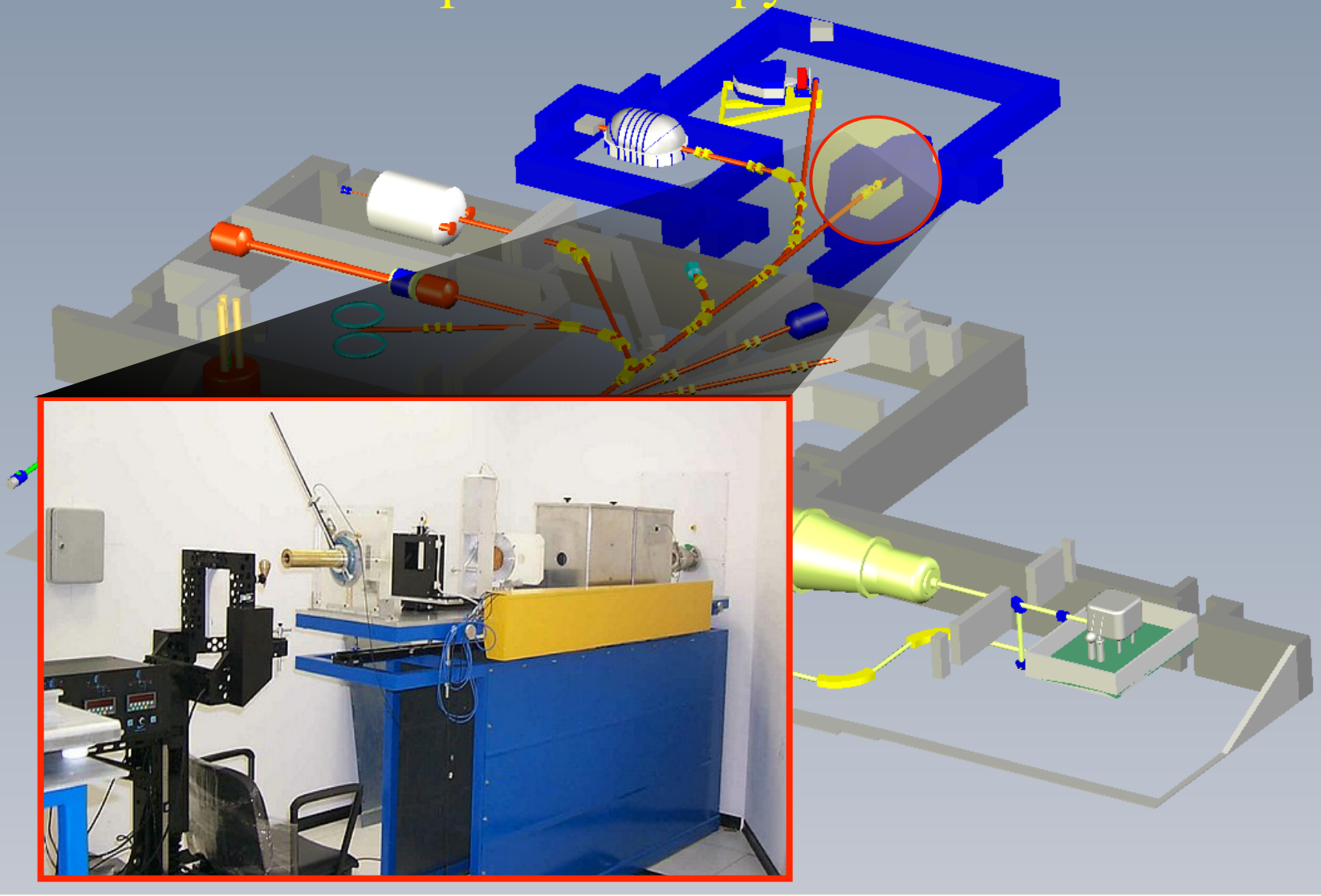
THE FIRST PORTABLE PIXE-α SYSTEM

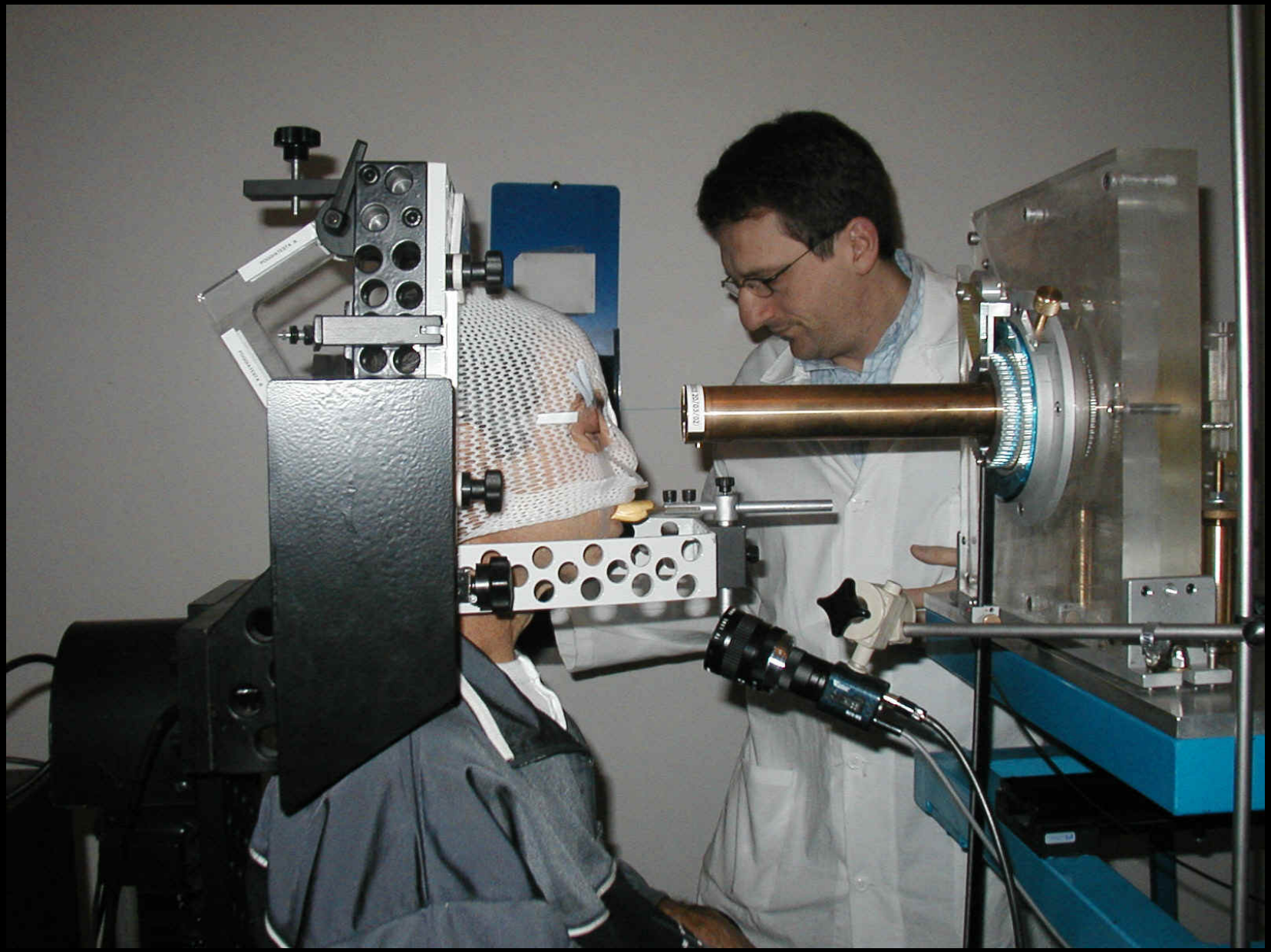
LICENCE CEA/INFN N° 9807435

The source was realised by electro deposition of ^{210}Po on a thin silver film. The source was sealed and it was certified as non contaminant.

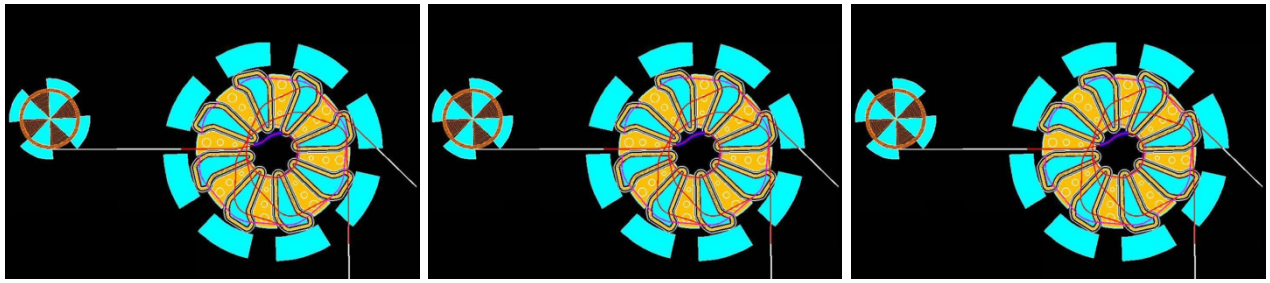
The energy of the out coming α particles is about 4.5 MeV.

CATANA proton therapy





DAEδALUS Experiment Overview $\bar{\nu}_\mu \rightarrow \bar{\nu}_e$

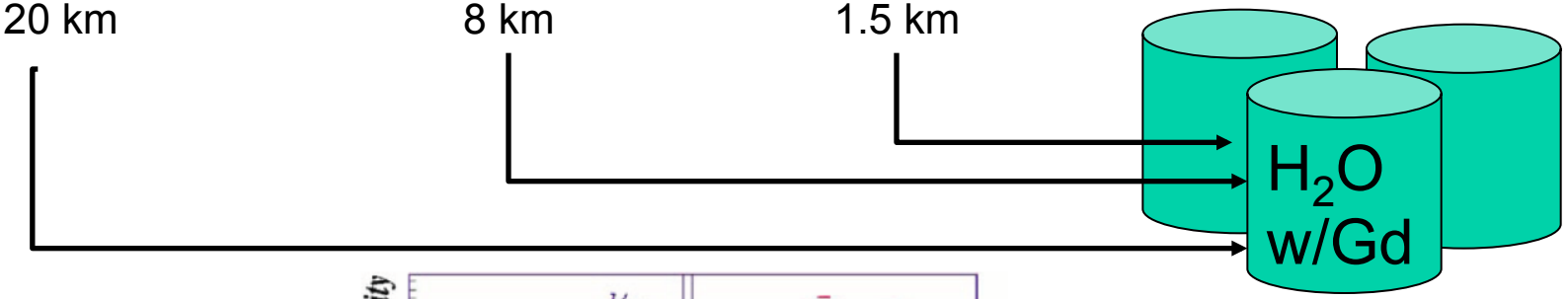


Proton beam
800 MeV @ 5 MW
20 km

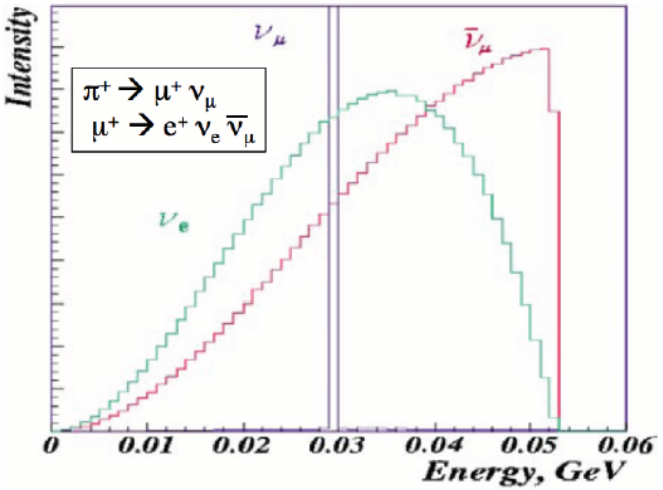
Proton beam
800 MeV @ 2 MW
8 km

Proton beam
800 MeV @ 1 MW
1.5 km

Three neutrino source locations are used in conjunction with the 300kton water Cerenkov detector complex at the 1.5 km level of DUSEL.



- π^- are quickly captured



- No creation of $\bar{\nu}_e$

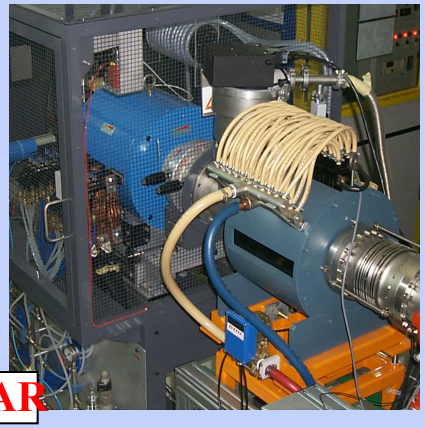
DAEδALUS

ECRIS and MDIS at INFN-LNS

ECR ion sources for the superconducting cyclotron

SERSE 18 GHz

CAESAR & S-CAESAR 14 GHz

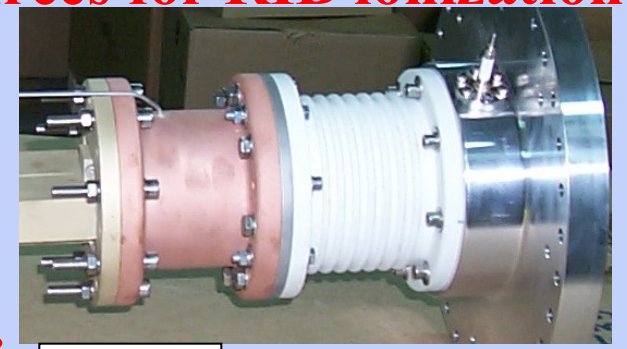


CAESAR

High efficiency microwave discharge ion sources for RIB ionization

MIDAS 2.45 GHz

MIDAS2 2.45 GHz



MIDAS 2

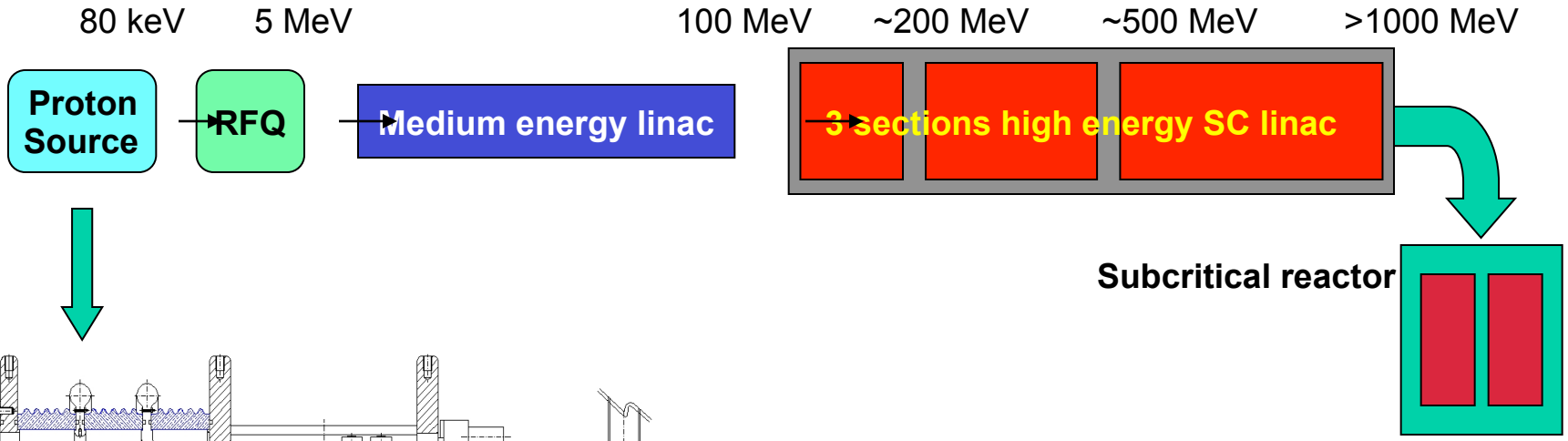
ECR ion sources for next generation facilitie

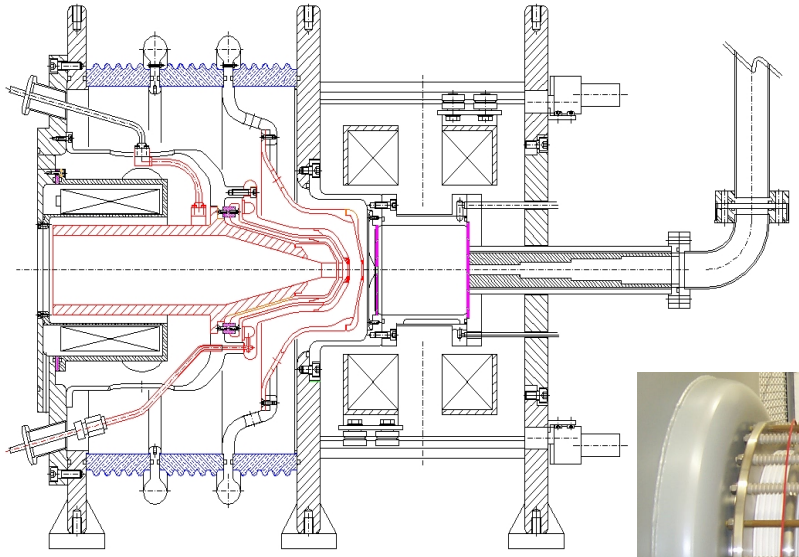
GyroSERSE (28-37 GHz)

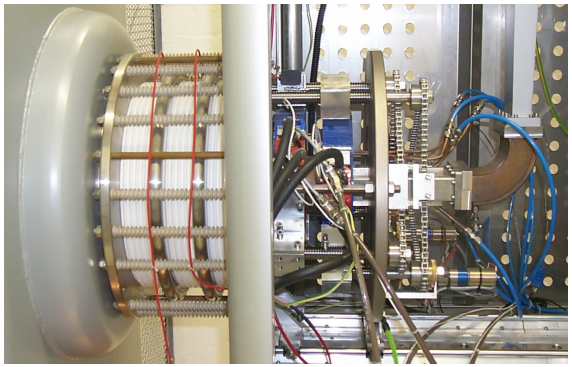
MSECRIS (28-37 GHZ)

The TRASCO/ADS Project

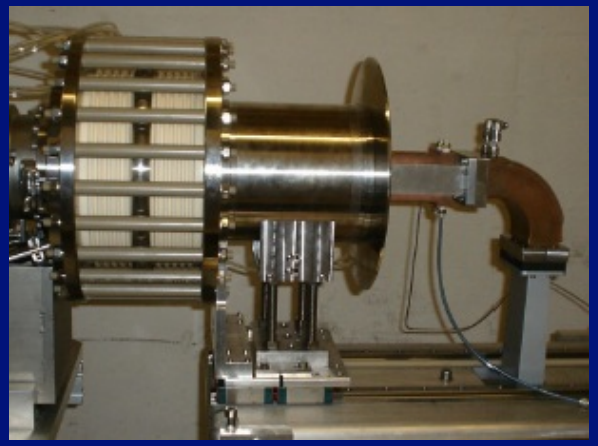
TRASCO (TRAsmutazione SCOrie) /ADS (Accelerator Driven System)



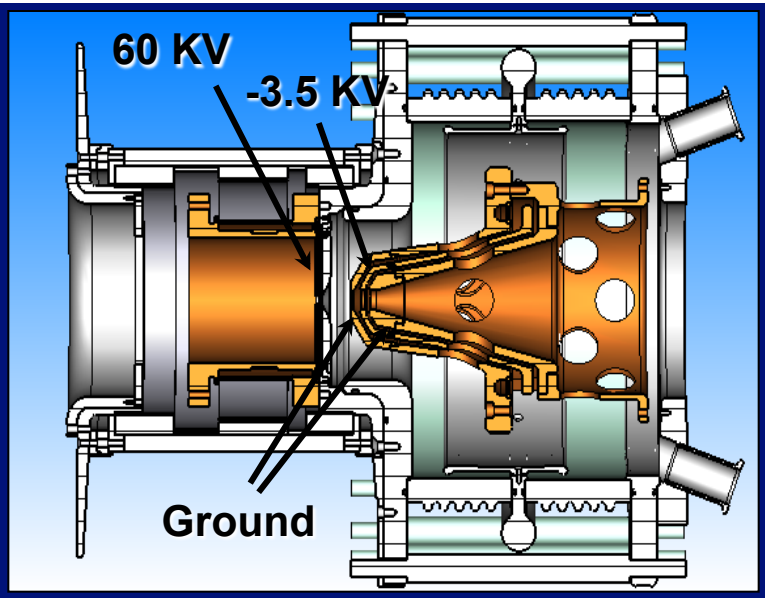


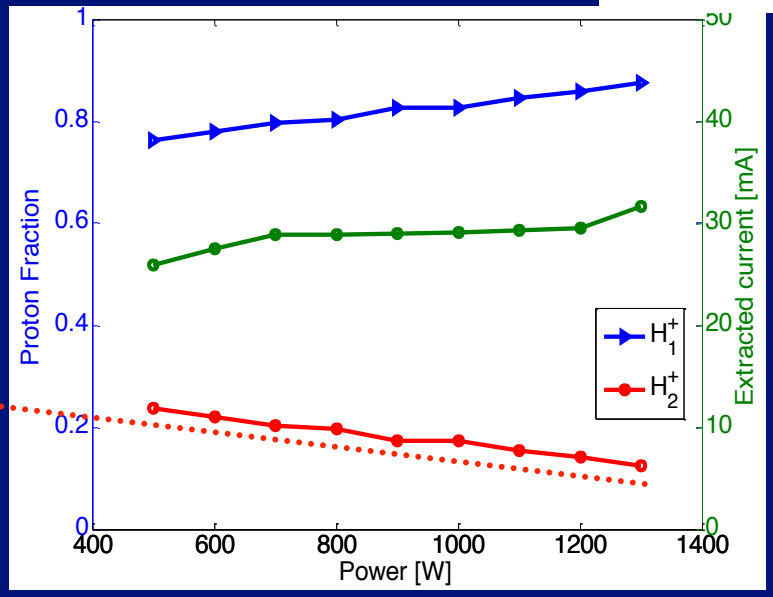


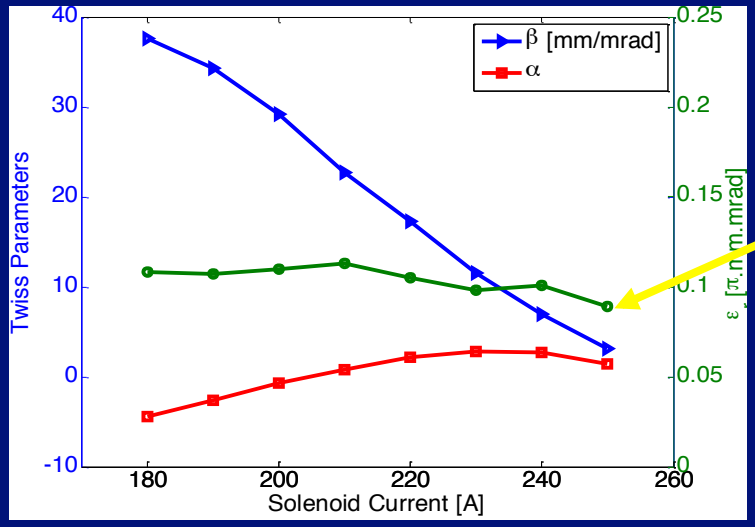
Versatile Ion Source (VIS)
Developed at LNS-Catania
by Gammino, Ciavola, Celona et Al.



VIS could deliver more than 20 mA of H2+ adjusting some parameters like: RF Power, Vacuum Pressure, Position of the permanent magnets

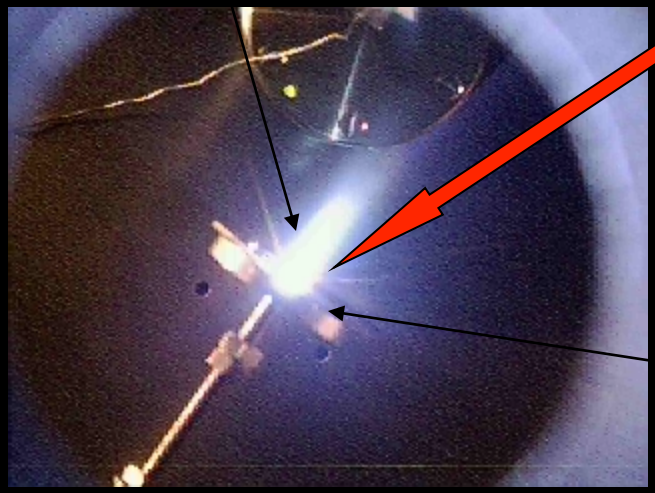


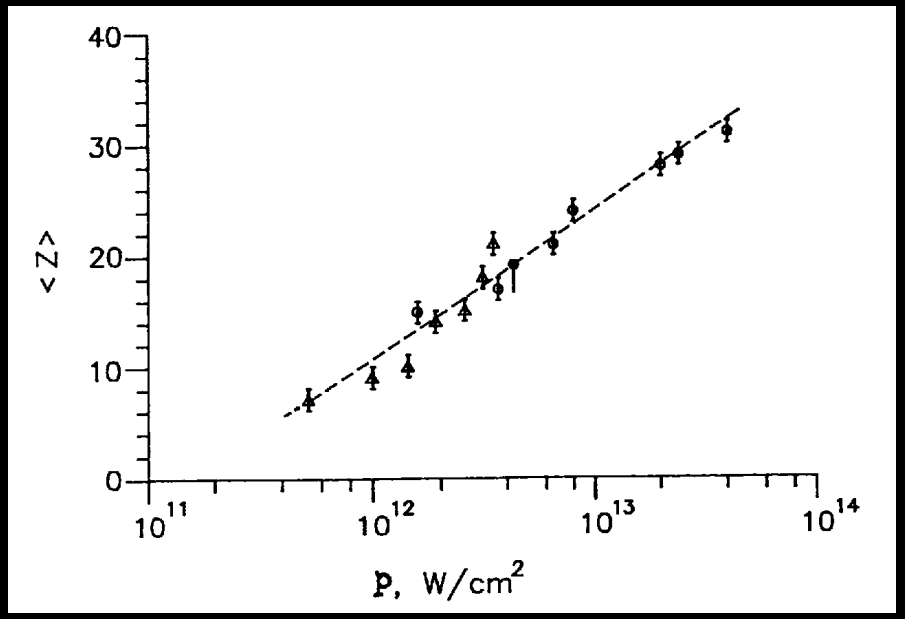




Good emittance

Laser Ion Sources





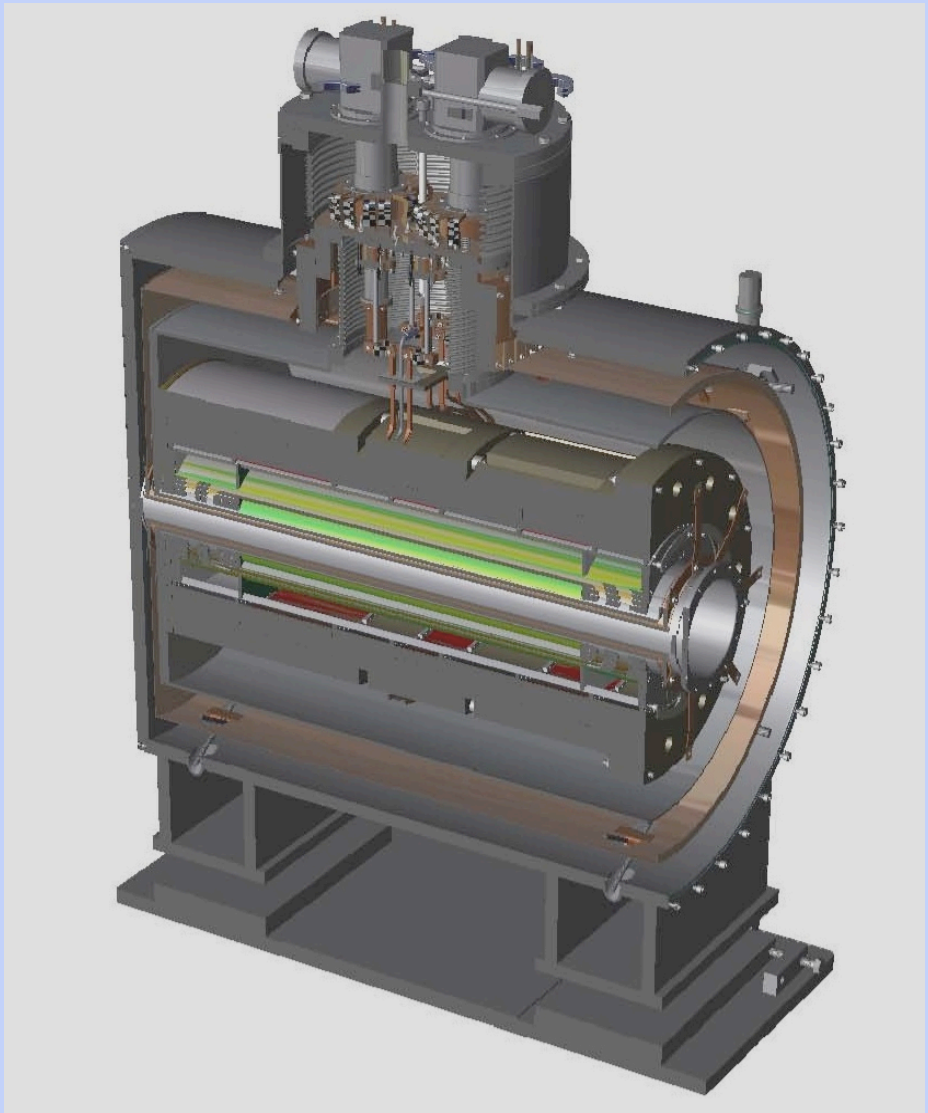
Charge states obtained with LIS

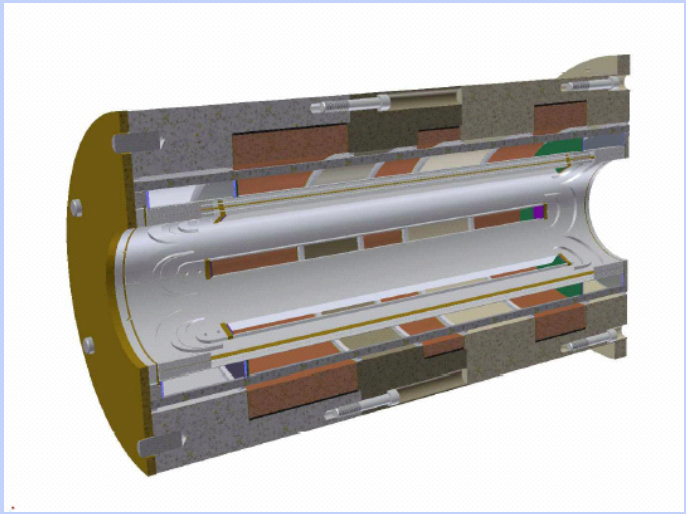
The SERSE ion source at LNS

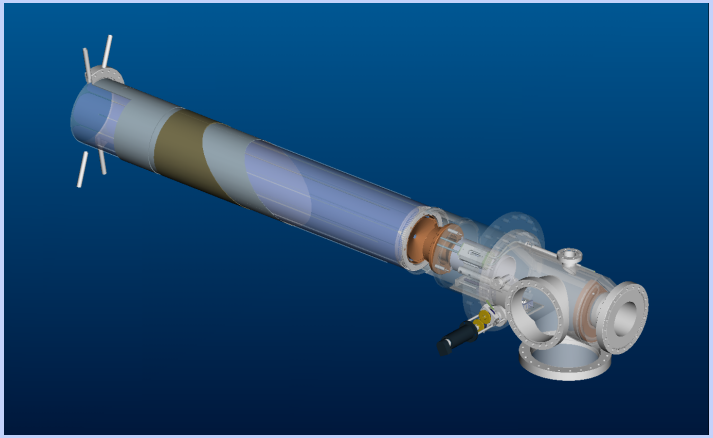
The scaling laws for ECR ion sources and the 'High B mode' concept have been confirmed by the experiments carried out by our team with SC-ECR at MSU (1993-96) and with SERSE at LNS (1998-2000) at variable frequency from 2.45 to 28 GHz.

These guidelines are commonly accepted, and the ISIBHI European collaboration (FP6) have chosen the design of the GyroSERSE source (a scaled version of the LNS SERSE source) as the best solution to optimize the performance of future accelerators.

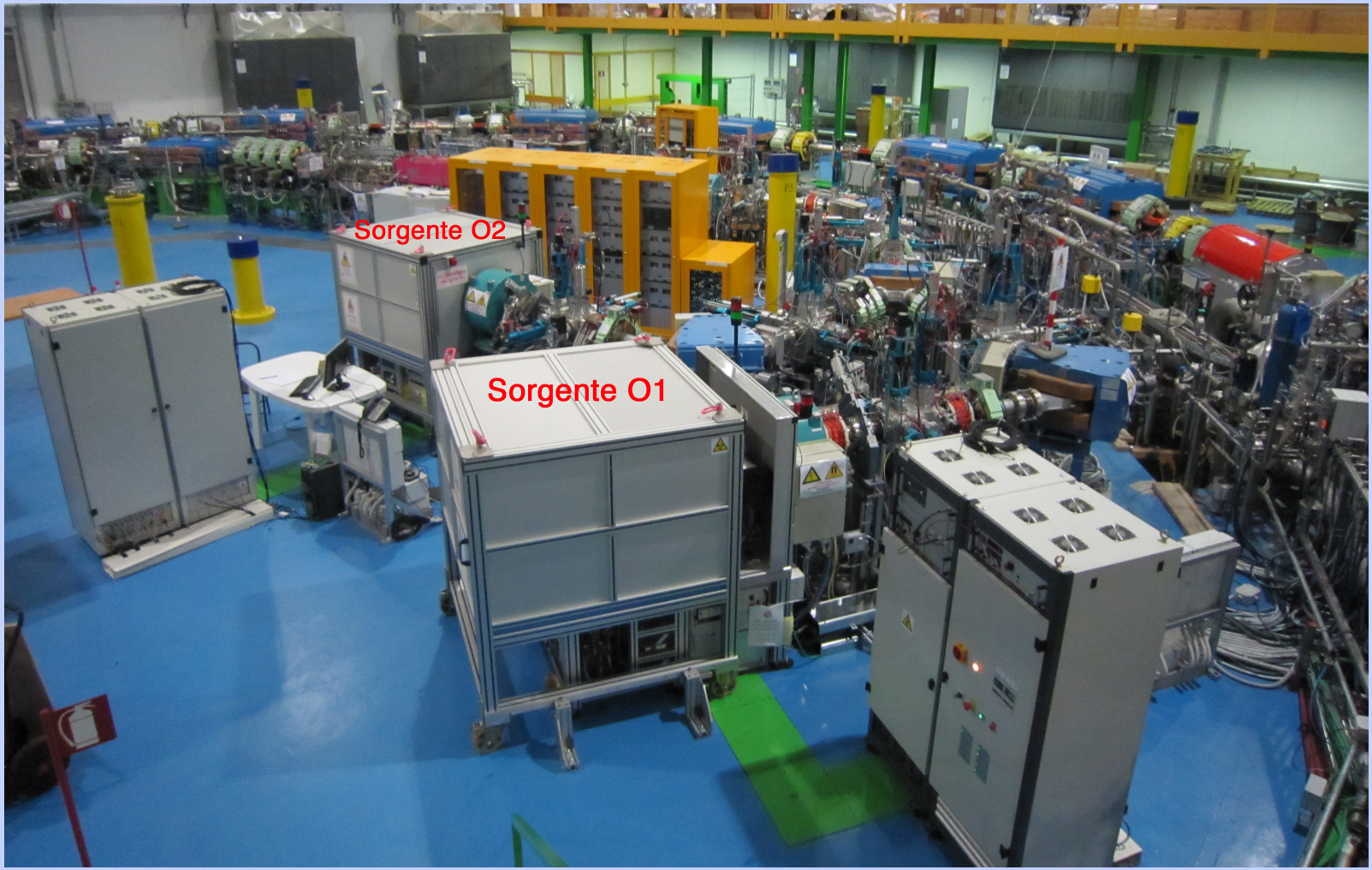
3rd generation ECRIS: MS-ECRIS



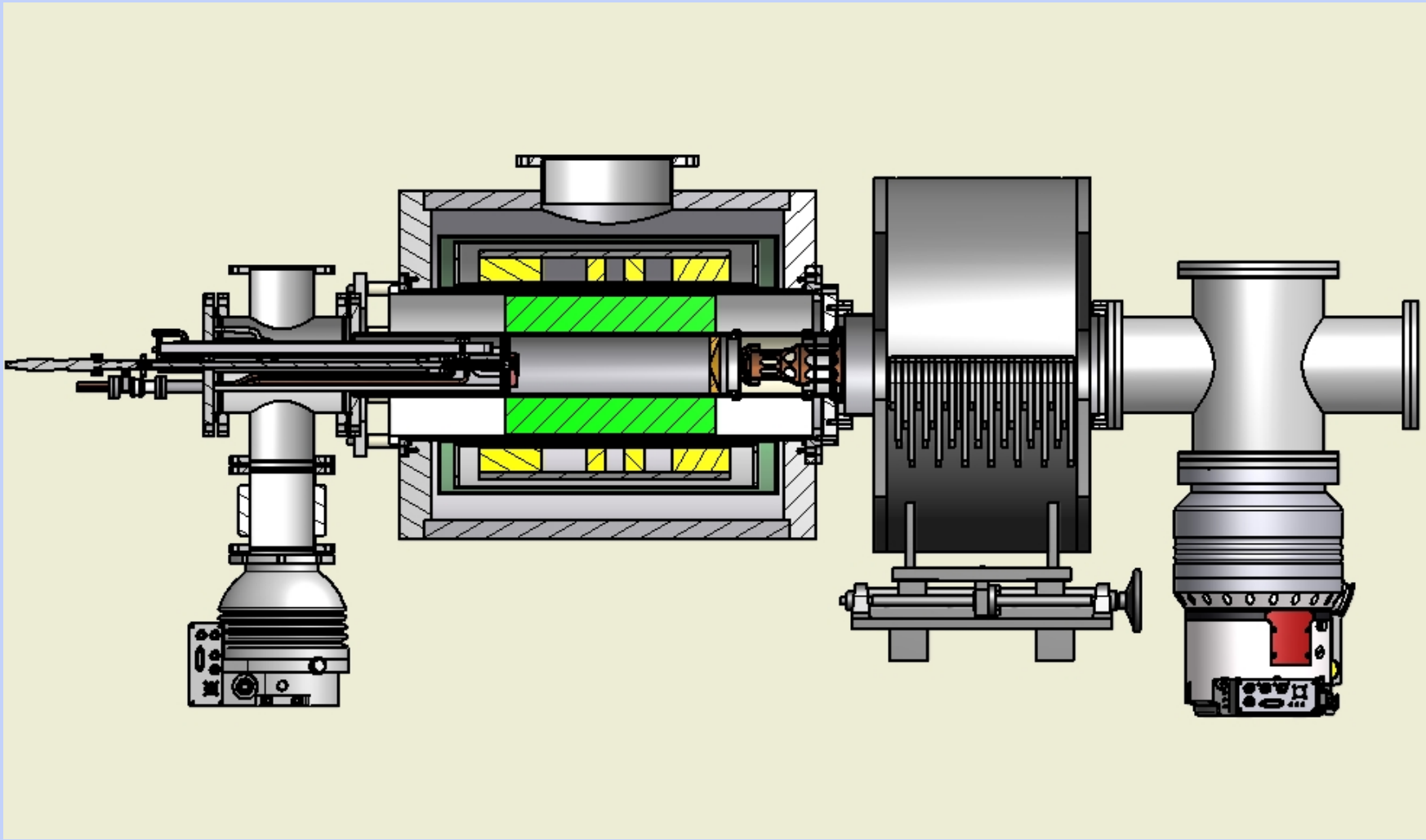




Ion sources for National Centre of Hadron therapy (CNAO Pavia)



MISHA assembly



Different projects of new sources are available in our ‘menu’, more conservative than MS-ECRIS

S-Caesar (14 GHz): an updated version of the source working at INFN-LNS since 1999, moderate to high performances and cost, design and construction yet available.

MISHA (18 GHz): high performance source, with permanent magnets for the radial field and SC magnets for the axial, large plasma chamber to host possible upgrades, design yet available.

ASIA (24 GHz): top performance source, with SC magnets for the radial field and for the axial, 40 kV operation for the extraction of larger current, large plasma chamber to host possible upgrades, design yet available, but need some detailed studies.