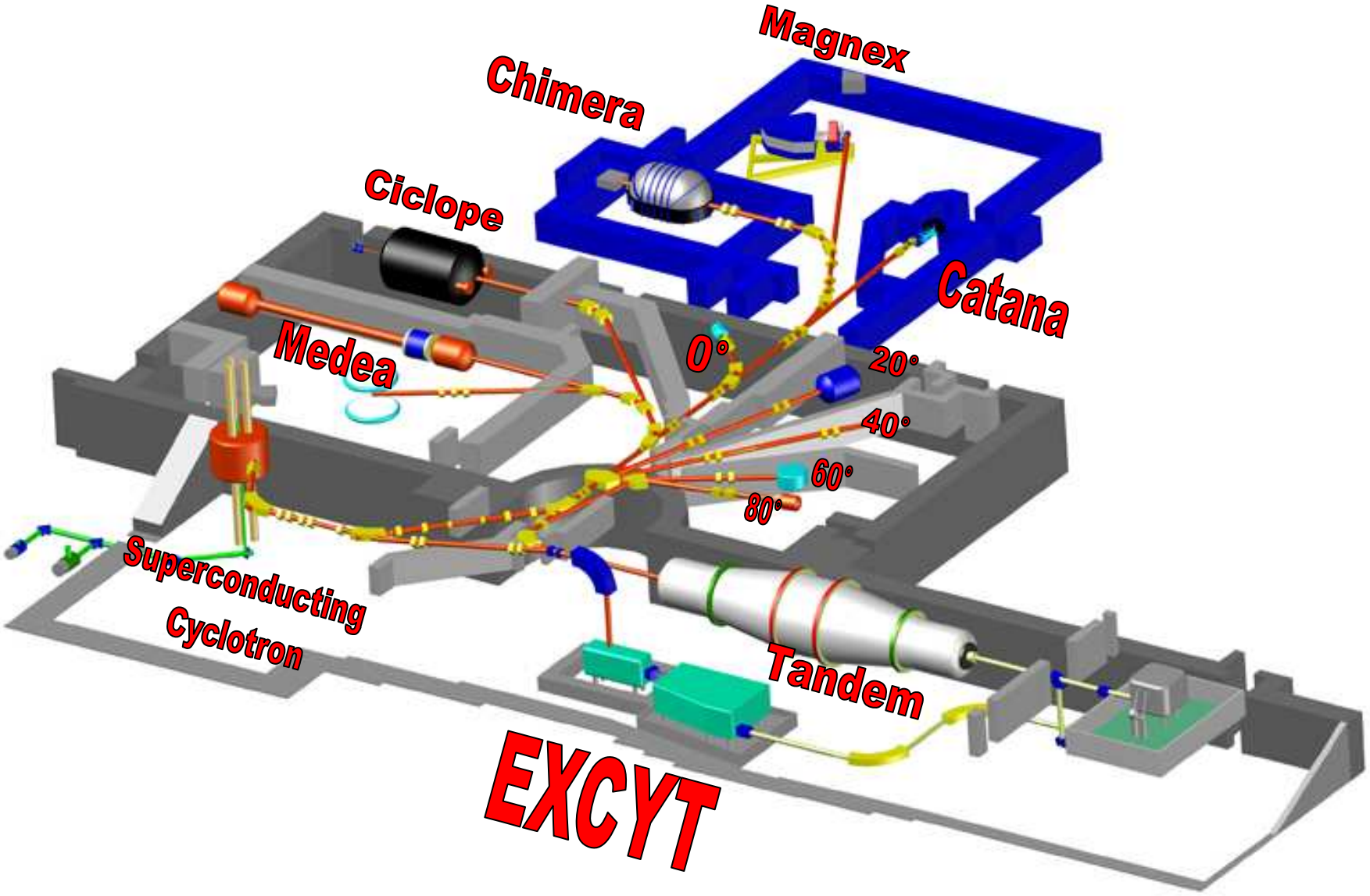
LNS lay-out : accelerators and experimental hall



Cryogenic plant extraordinary maintenance

- **Cyclotron coils kept cold (4.2 K) continuously from 1992 to 2007**
- **Pressure test of the cryostat imposed by law**

The Cryogenic maintenance started in June 2007 and ended in February 2008

Warm-up successfully completed
July 1st 2007

Ten-yearly cryostat test successfully done
Sept. 2007

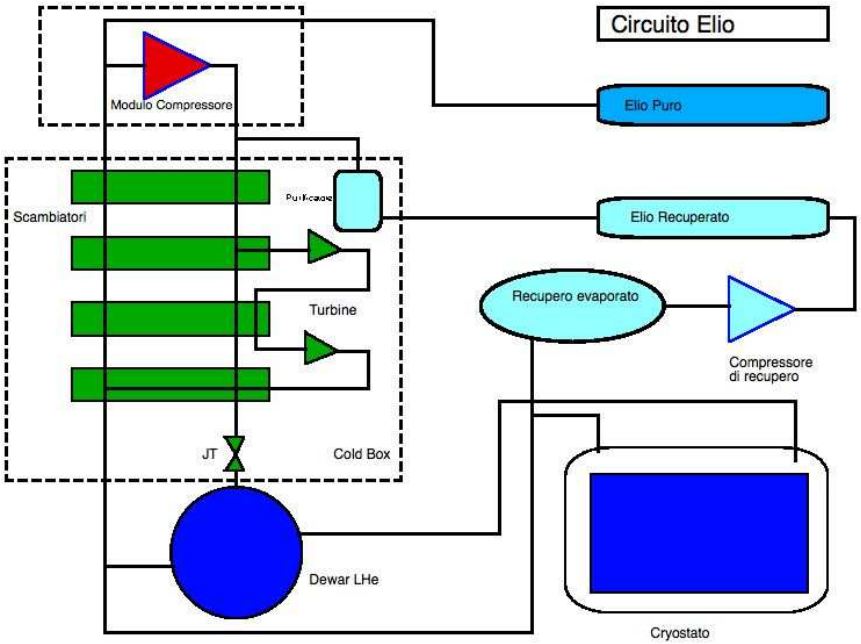
Maintenance of the Air Liquide liquefier
Dec. 2007

Maintenance of the compressor
December 2007
January 2008

Start of the cryogenic plants
January 2008

Modification of a LHe pipe in the cryostat
February 2008

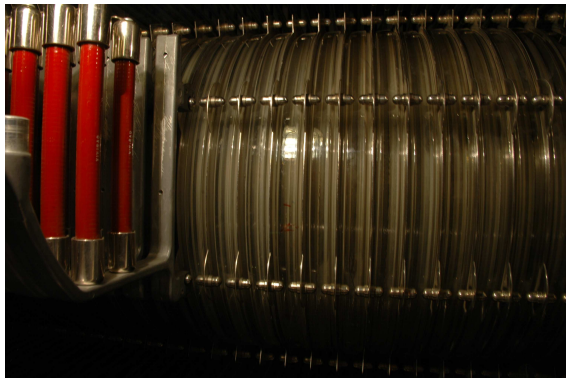
Cool-down of the cryostat
February 11 - 27

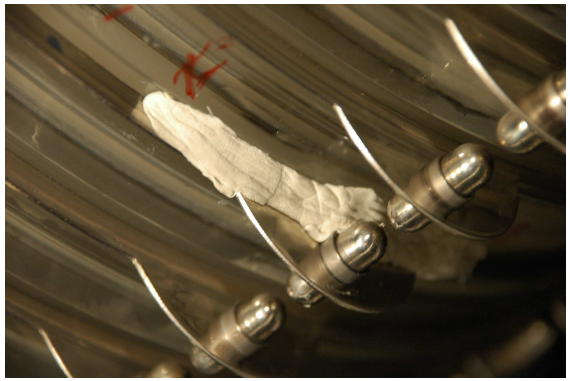


Problem on the cryostat vacuum

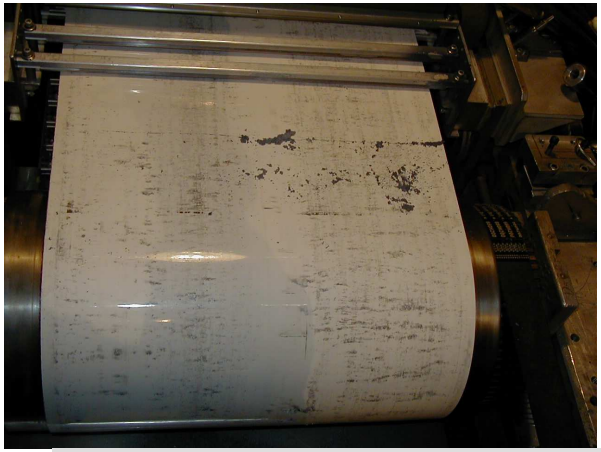
Tandem status

Leaks have been detected in the 1° and 8° accelerating tubes





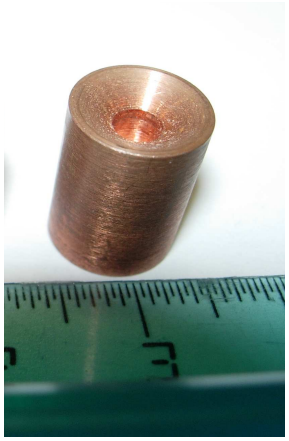
Alternatives to High Voltage belts have not been found

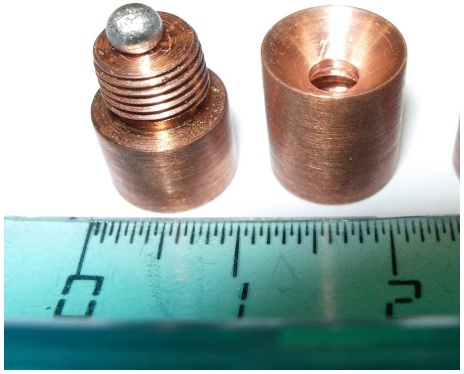


Contacts with VIVIRAD (France) to face both the belt question and the tubes problems

^{14}C beam at the Tandem

The project started: many initiatives have been realised



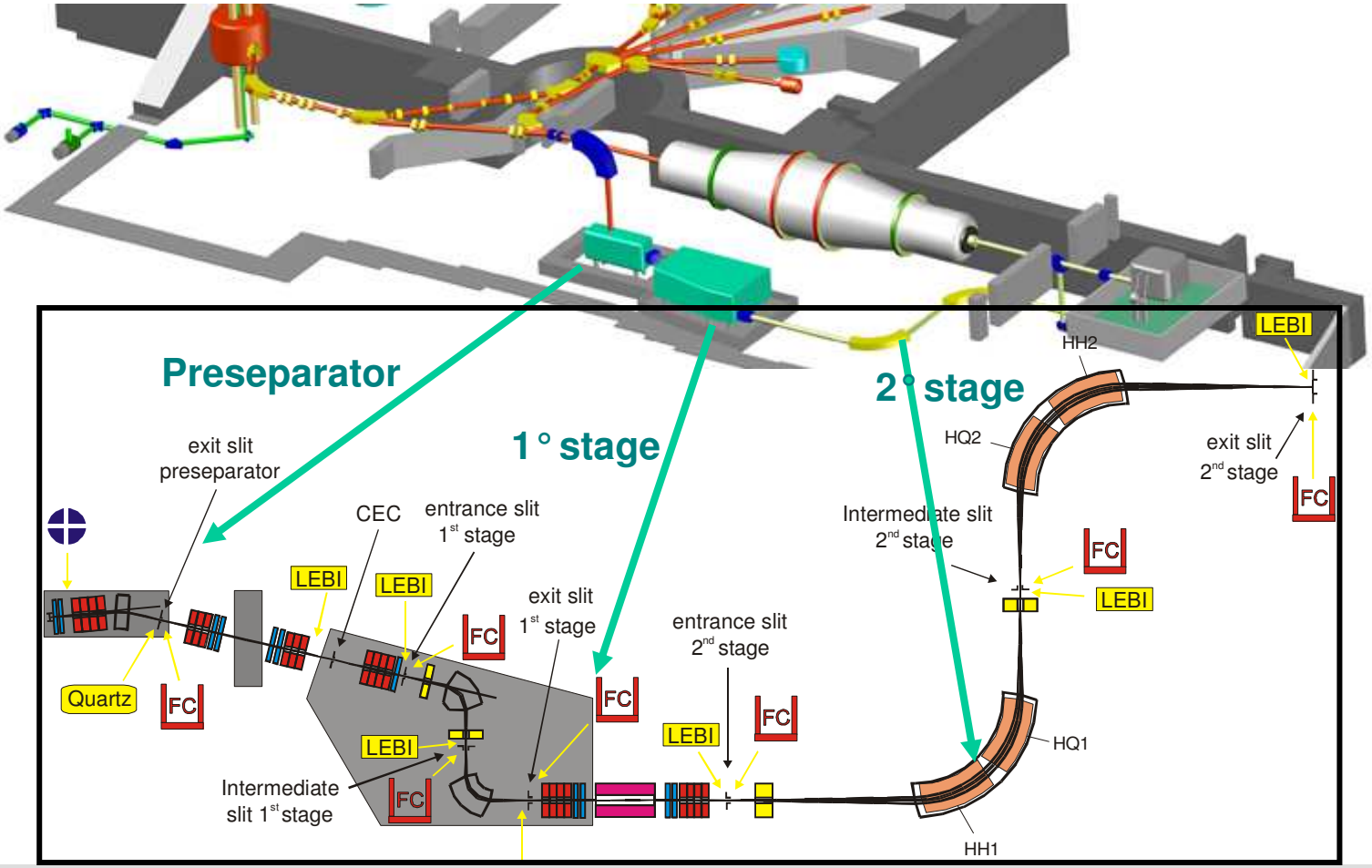


Contacts with Dr. Hans Joerg Maier to produce $Fe_3{}^{14}C$ pellets

BUT……

^{14}C elemental powder is not easy to be available with the required chemical characteristics

EXCYT: the mass separator



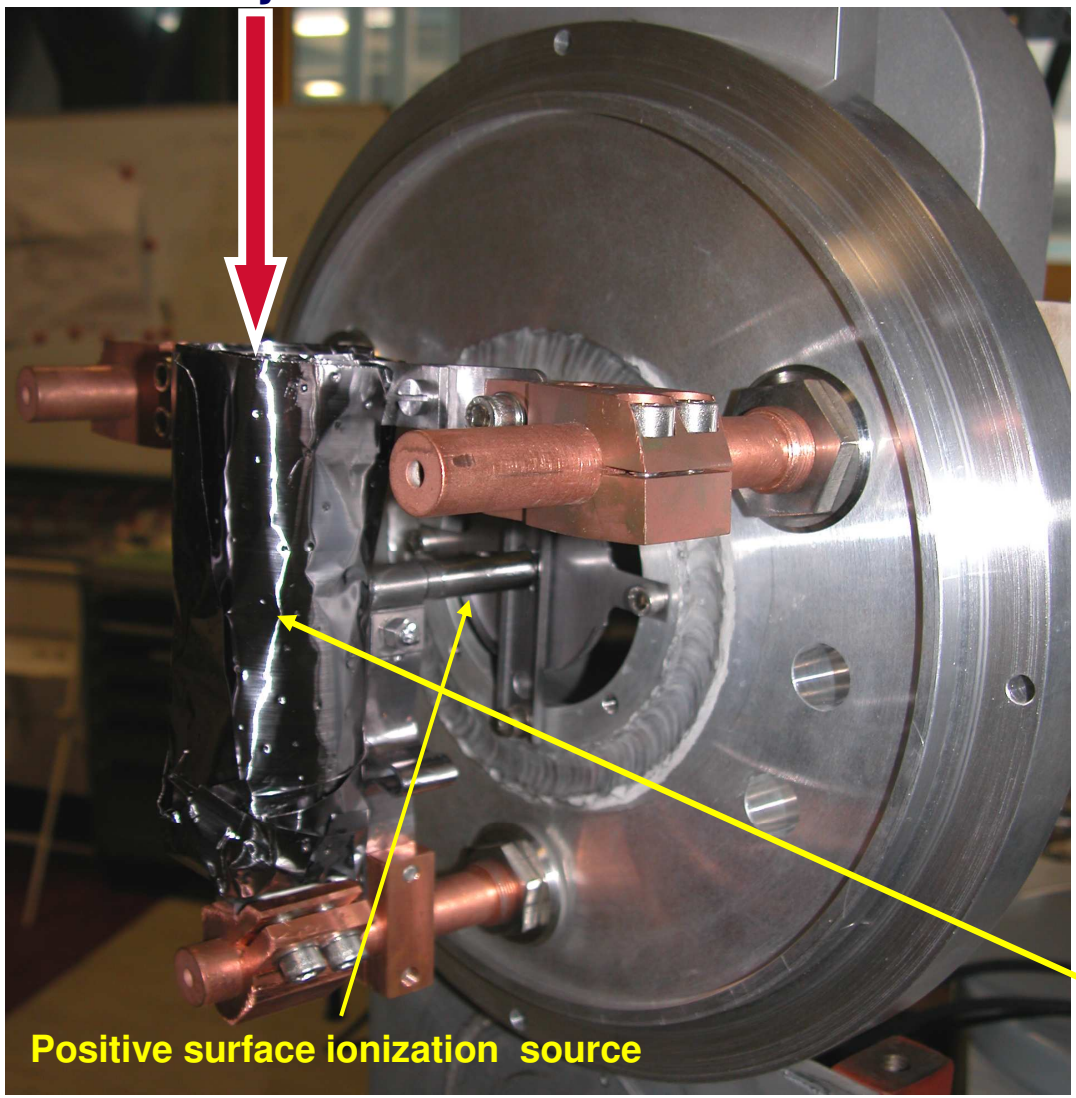
The mass separator system consists of a pre-separator and 2 main stages, the pre-separator and the first stage being assembled on two 250 kV platforms

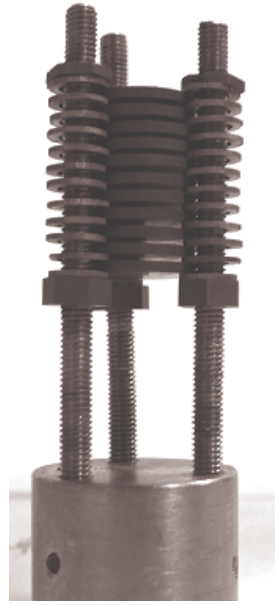
$(M/\Delta M)_{Pre} \approx 180$ (pre-separator : 18° magnet and a quadruplet of 4 electrostatic quadrupoles)

$(M/\Delta M)_{1st} \approx 2000$ (I stage: 2 magnets (77°, 90°) and 2 quadruplets of 4 electrostatic quadrupoles)

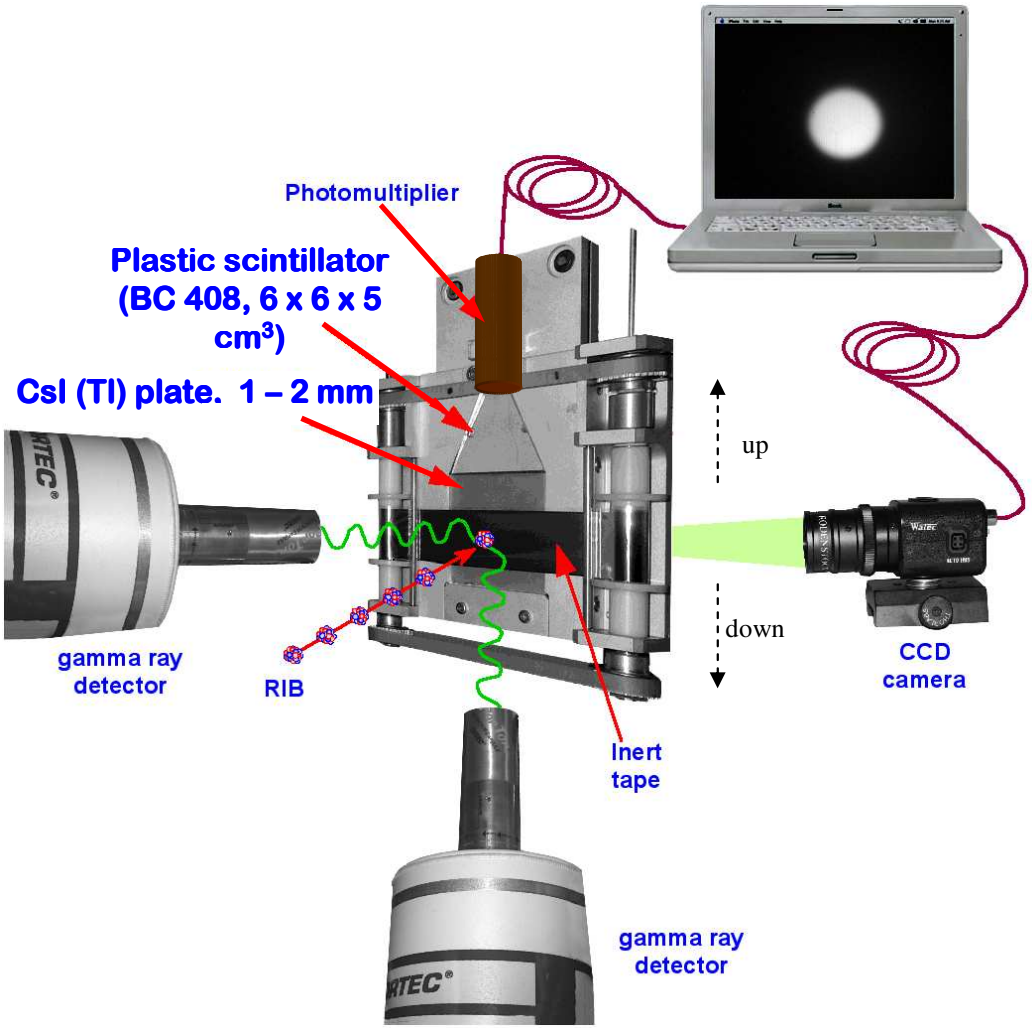
$(M/\Delta M)_{2nd} \approx 20000$ (II stage: 2 magnets (90°) and a quadruplet of 4 electrostatic quadrupoles)

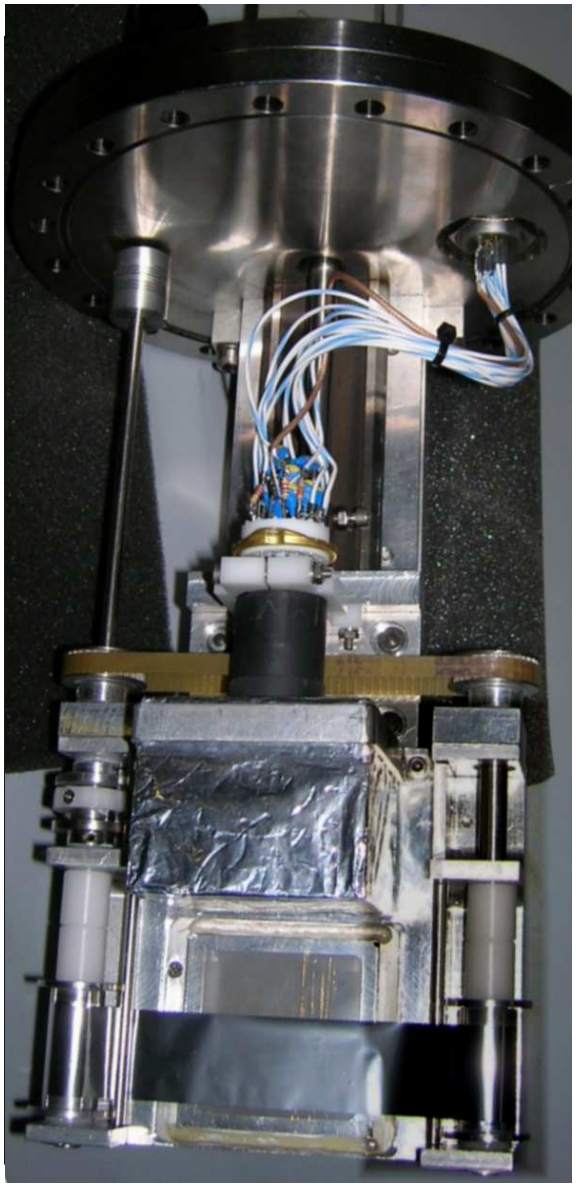
The Target-ion source complex



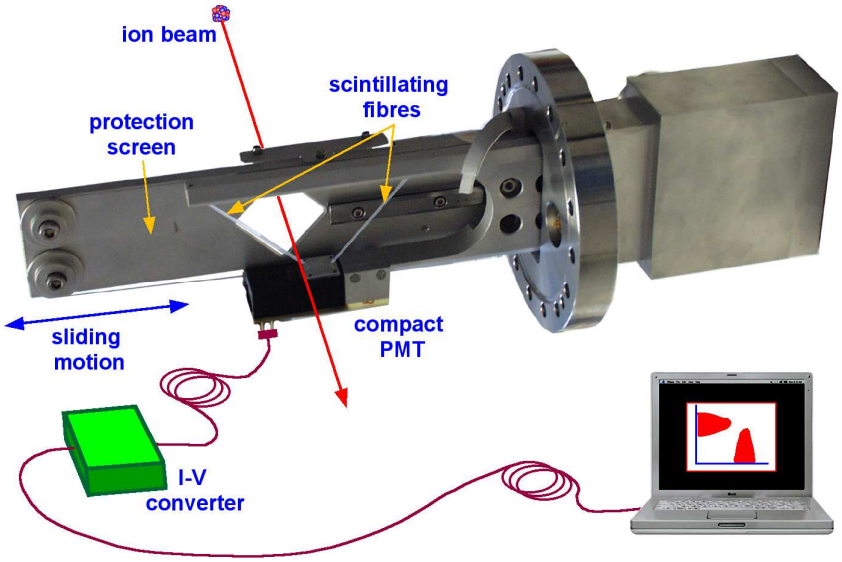


Diagnostics of Low Energy Beams : LEBI





Diagnostics for High Energy (Tandem) RIBs

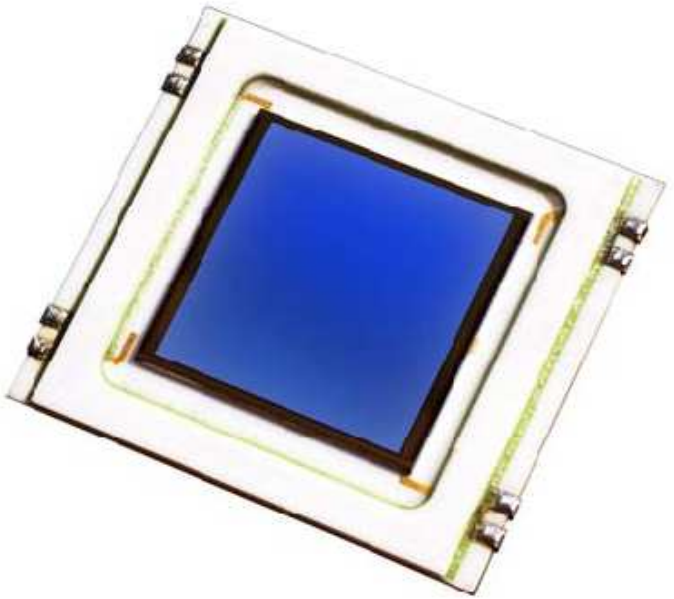


Position sensitive silicon detectors

- **beam intensity measurement**
- **beam energy spectra**
- **2D beam profile monitor**
- **identification of the beam particles (ΔE – E) by adding a thin silicon detector to obtain a telescope configuration**

Beam profile monitor based on a pair of scintillating fibres scanning the beam

Fibres diameter: 300 ÷ 500 μm
Plastic fibres for low intensity



size: 50 x 50 mm^2

EXCYT transmission factors

October 2008

Primary beam power	LEBI1 (pps) $^8Li^+$	CEC (10 keV) $^8Li^-$	Through platforms $^8Li^-$	Through 2nd stage	Tandem entrance	Through Tandem @7MV	On target $^8Li^{3+}$
		2.8%	100%	100%	100%	47%	70%
100watt	$5.4 \cdot 10^6$	$1.5 \cdot 10^5$	$1.5 \cdot 10^5$	$1.5 \cdot 10^5$	$1.5 \cdot 10^5$	$7.0 \cdot 10^4$	$5.0 \cdot 10^4$

New triplet needed

Production: at least 3 times the value found with the cylinder target

A factor 1.4 after the Charge Exchange Cell (CEC)

The Tandem transmission could be increased by a factor 1.3

With a primary beam power of 200 watt, $1.8 \cdot 10^5$ pps might be expected on target

Experiments approved with EXCYT

BIGBANG

Measurement of the ^{8}Li(α,n)^{11}B cross section in the c.o.m. energy range from about 1.5 MeV down to the Gamow peak (~0.5 MeV). Key reaction in the inhomogeneous Big-Bang model

Published on Physics Letters B 664 (2008) 157-161

RCS

Measurement of the ^{8,9}Li + ^{28}Si reaction cross section at near barrier energies to determine the size of the unstable Li isotopes

Data analysis in progress

RSM

Measurement of the α -^{8}Li elastic scattering excitation functions in reverse kinematics, aimed at studying backward angle resonances associated with cluster configurations of ^{12,13}B

$5 \cdot 10^{4}$ pps on target

done

MAGNEX-RIB

Exploratory attempt to investigate ^{8}He states using the (^{8}Li,^{8}Be) charge exchange reaction

2.10^{5} pps required – Beam line to be equipped with diagnostics

EXCYT-CHIMERA

Study of ^{10}Li resonances through the ^{9}Li(d,p)^{10}Li reaction

2.10^{3} ^{9}Li required – Beam line to be equipped with diagnostics

EXCYT status and prospects

- **The facility has been commissioned and 3 experiments have been carried out**
- **For ^{8}Li an intensity of $5 \cdot 10^{4}$ pps is available on target**

Safety and reliability:

Revision of the remote handling for the source and the electrostatic deflector

Air and water treatment

Pump exhaust treatment

Optimization:

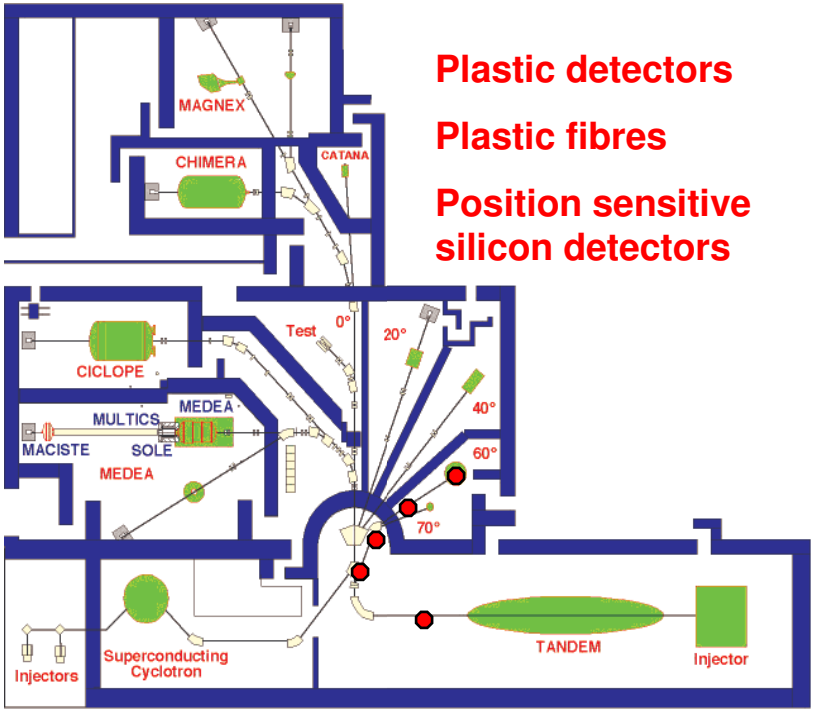
A new focusing element in the Tandem injection line to improve the acceleration efficiency

Mechanical re-design of the target (ioniser) to improve the electric contacts

EXCYT status and prospects

Short term upgrading:

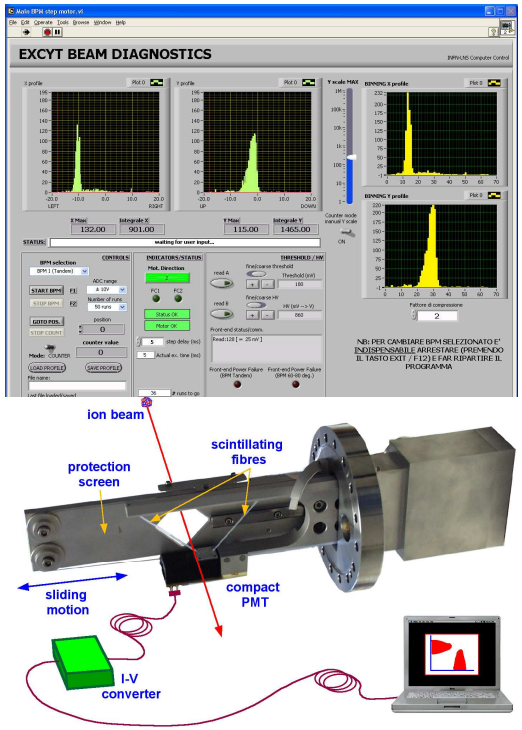
- **Provide the long beam lines (Magnex and Chimera) with low intensity diagnostics**
- **Provide the platforms with services to install different sources**

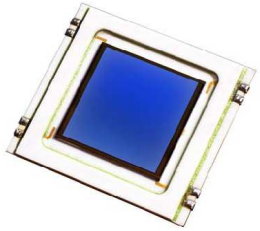


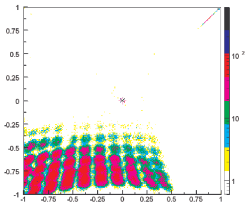
Plastic detectors

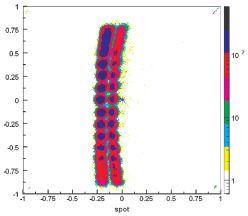
Plastic fibres

Position sensitive silicon detectors









EXCYT status and prospects

Short term upgrading: possible future beams

^{8,9}Li	Positive Ion Source	$2 \cdot 10^5$ pps ^{8}Li	($2 \cdot 10^7$ @ 300 KeV)
^{21}Na	Positive Ion Source	$3 \cdot 10^4$ pps	($3 \cdot 10^6$ @ 300 KeV)
^{15}O	Hot Plasma Ion Source	$2.5 \cdot 10^6$ pps	($3 \cdot 10^7$ @ 300 KeV)
	ε_{CEC}=30%, present target		
^{25,26}Al	Hot Plasma	Target: SiC	
^{26,27}Si	Hot Plasma	Target: SiC	
^{7,11}Be	Hot Plasma		
^{10,11}C	Hot Plasma		
^{38,39,40}Cl	Negative Ion Source, no CEC		
^{17,18}F	KENIS ion source, no CEC		

EXCYT prospects

R&D activities:

- **Test bench installation**
- **Target ion source complex**

R&D activities on the Target – Ion source complex

- **Better undestanding of diffusion-effusion models**
- **New target materials (e.g. Foams, Fibers, Ta foils) and geometry**
- **New PIS surface materials**
- **Sources development (negative, microwave)**

In collaboration with the project SPES at LNL