



CERN ISOLDE

The Isotopes Separator Online DEvice

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The Nuclear Chart

periodic system
 No
 Pb
 Sn
 Ni
 B
 Be
 Li
 He
 H

¹⁸⁵Pb₈₂

⁸²Pb₁₀₃

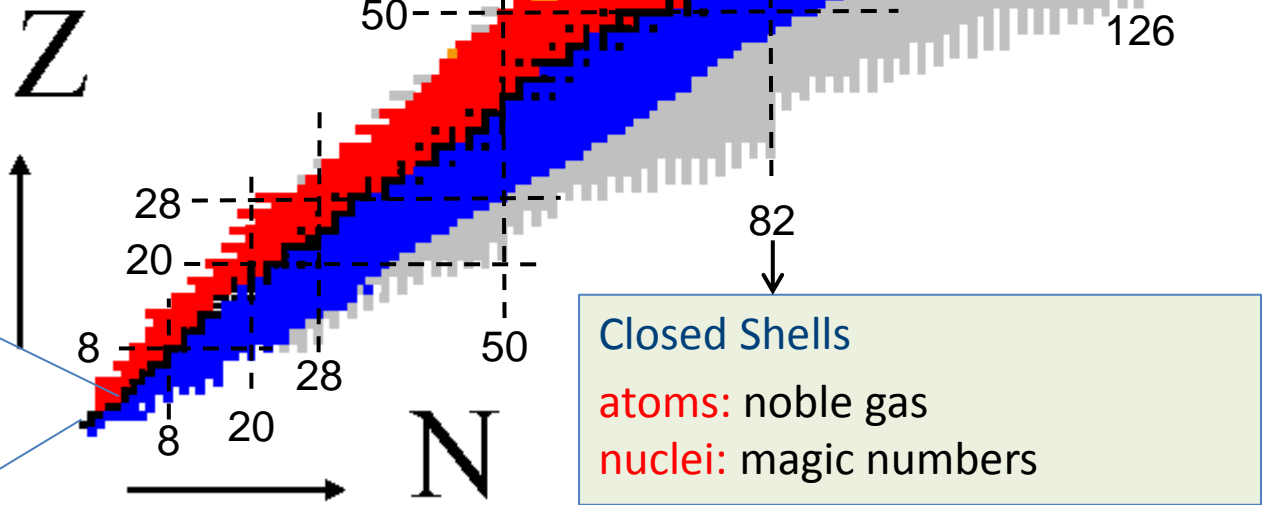
4.07 s (13/2 ⁺) Eex 60# (40#) α=50 (25)% β ⁺ ?	6.3 s (3/2 ⁻) M ⁻ 11541 (16) α=50 (25)% β ⁺ ?
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PERIODIC TABLE OF THE ELEMENTS

http://www.kj-split.kr/periodictcu/

GROUP I 1	IIA 2	RELATIVE ATOMIC MASS (1)																VIIIA 18
GROUP IUPAC		GROUP CAS																VIIIA
		ATOMIC NUMBER																VIIIA
		SYMBOL																VIIIA
		ELEMENT NAME																VIIIA
		Metal																VIIIA
		Semimetal																VIIIA
		Nonmetal																VIIIA
		Alkali metal																VIIIA
		Alkaline earth metal																VIIIA
		Transition metals																VIIIA
		Lanthanide																VIIIA
		Actinide																VIIIA
		Standard state (25 °C, 101 kPa)																VIIIA
		Ne - gas																VIIIA
		Fe - solid																VIIIA
		Ga - liquid																VIIIA
		Tl - synthetic																VIIIA

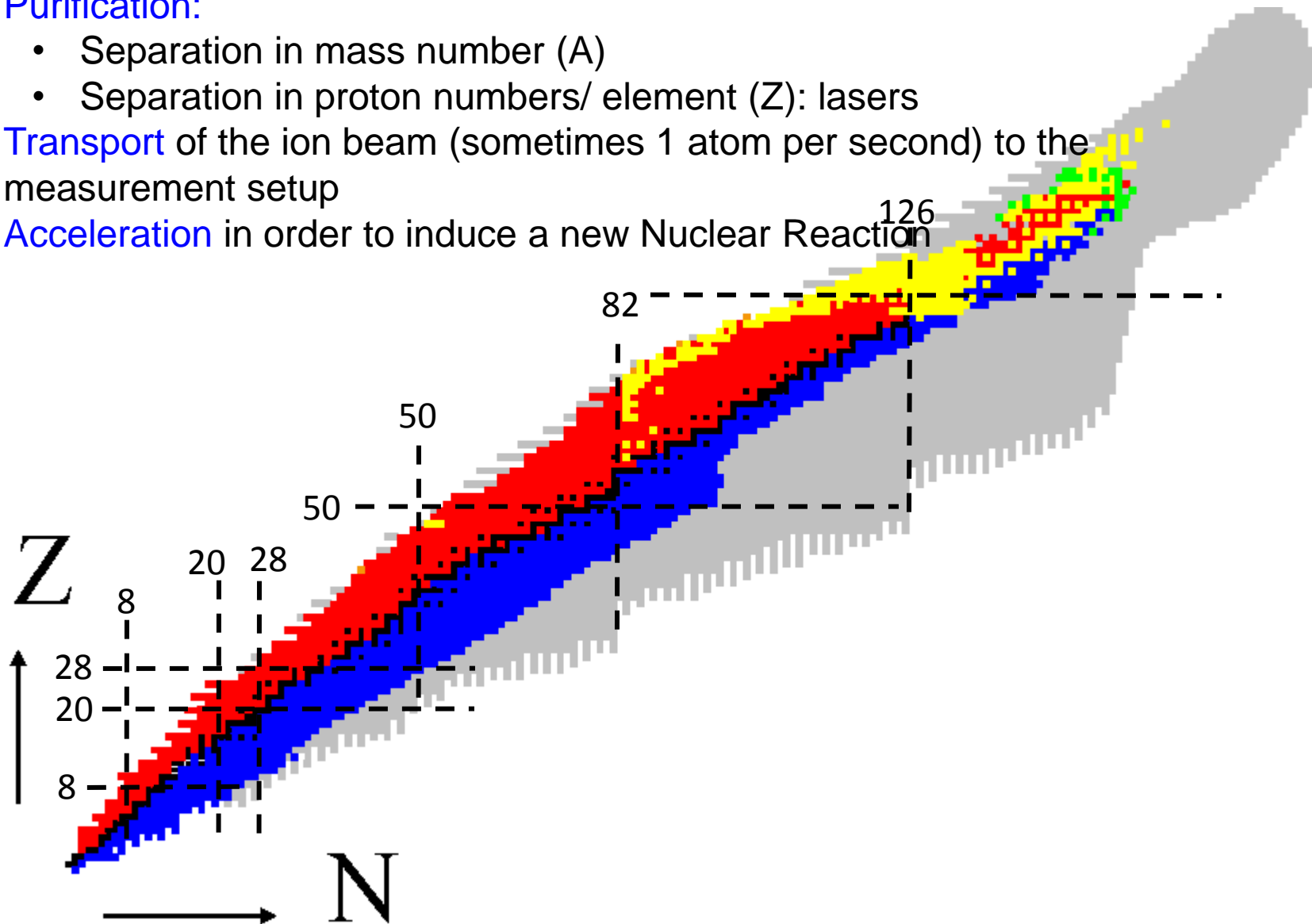
1	2	LANTHANIDE																				18																							
3	4	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89											
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu													He																		
Lanthanum	Cerium	Praseodymium	Neodymium	Promethium	Samarium	Europium	Gadolinium	Terbium	Dysprosium	Holmium	Erbium	Thulium	Ytterbium	Lutetium													Helium																		
																		89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109							
																		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr													He
																		Actinium	Thorium	Protactinium	Uranium	Neptunium	Plutonium	Americium	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium	Lawrencium													Helium



- stable
- β⁺ decay
- β⁻ decay
- α decay
- p decay
- fission
- predicted

Production of Radioactive Ion beams

- **Nuclear Reaction:** proton (1.4 GeV) + ^{238}U (10^{12} atomen per seconde)
- **Purification:**
 - Separation in mass number (A)
 - Separation in proton numbers/ element (Z): lasers
- **Transport** of the ion beam (sometimes 1 atom per second) to the measurement setup
- **Acceleration** in order to induce a new Nuclear Reaction



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- It all starts with a bottle of hydrogen ...



ISOLDE @ CERN

... followed by the LINAC2 ...



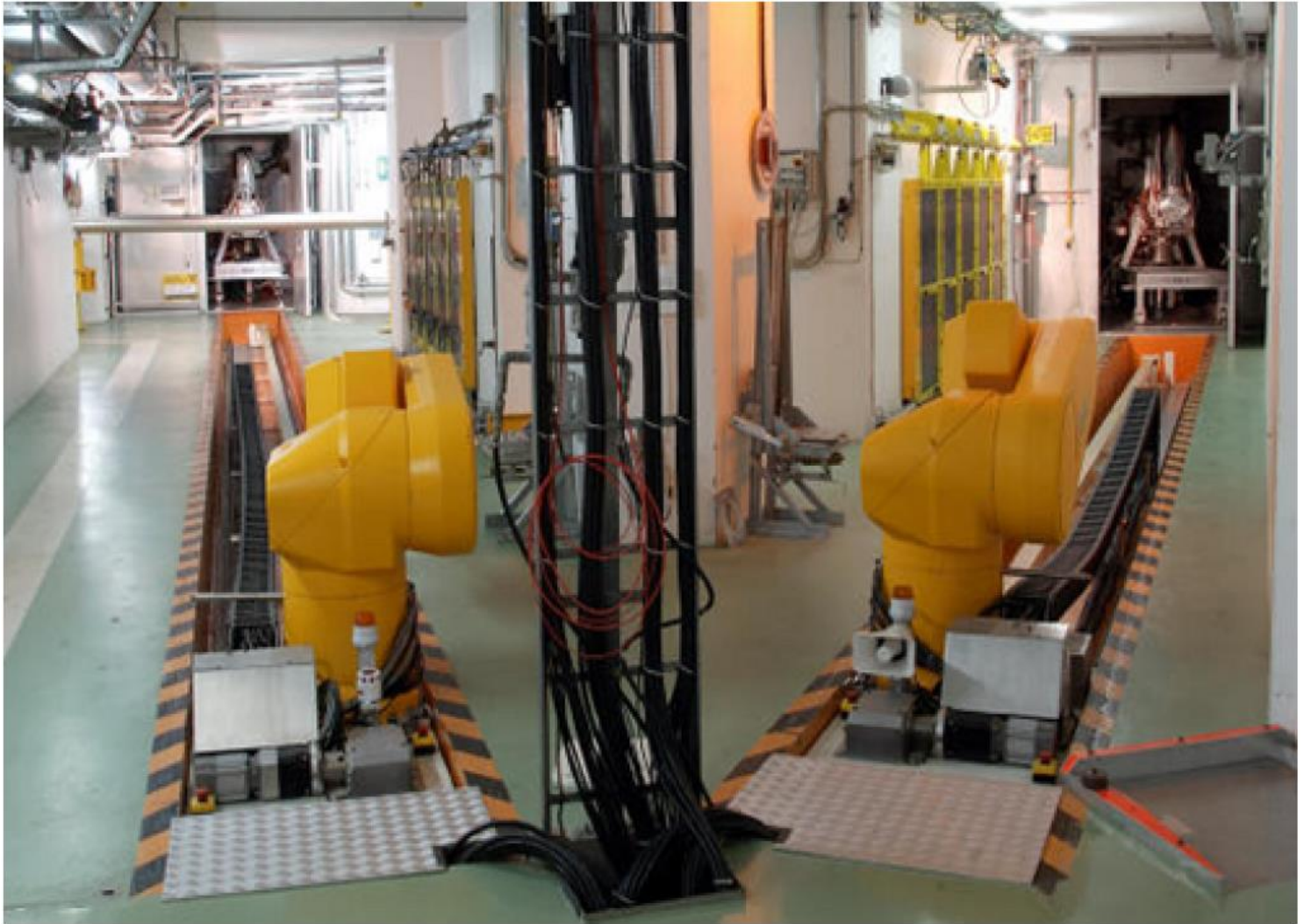
ISOLDE @ CERN

... and the 4 rings of the PSBooster



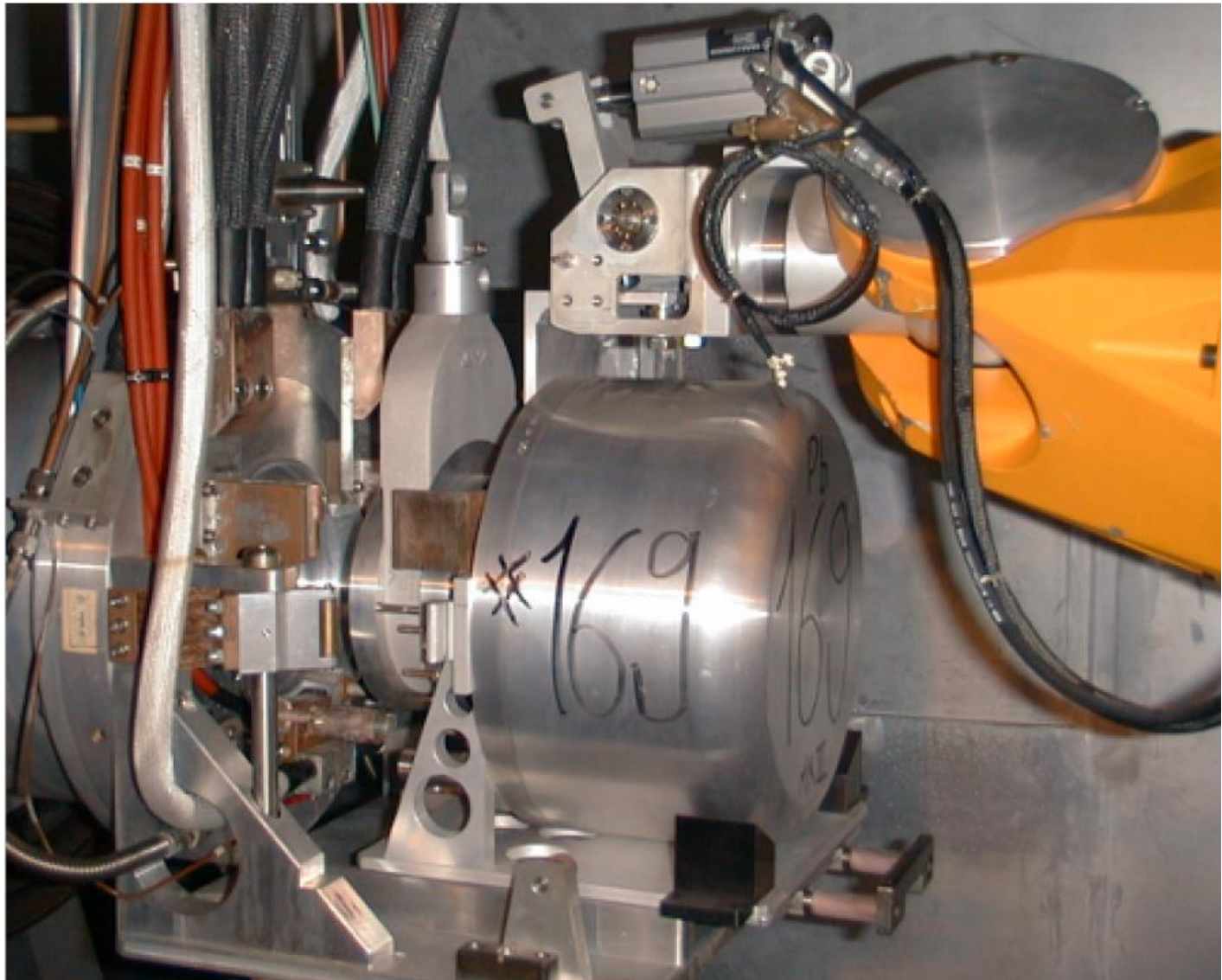
ISOLDE targets

Service Robots



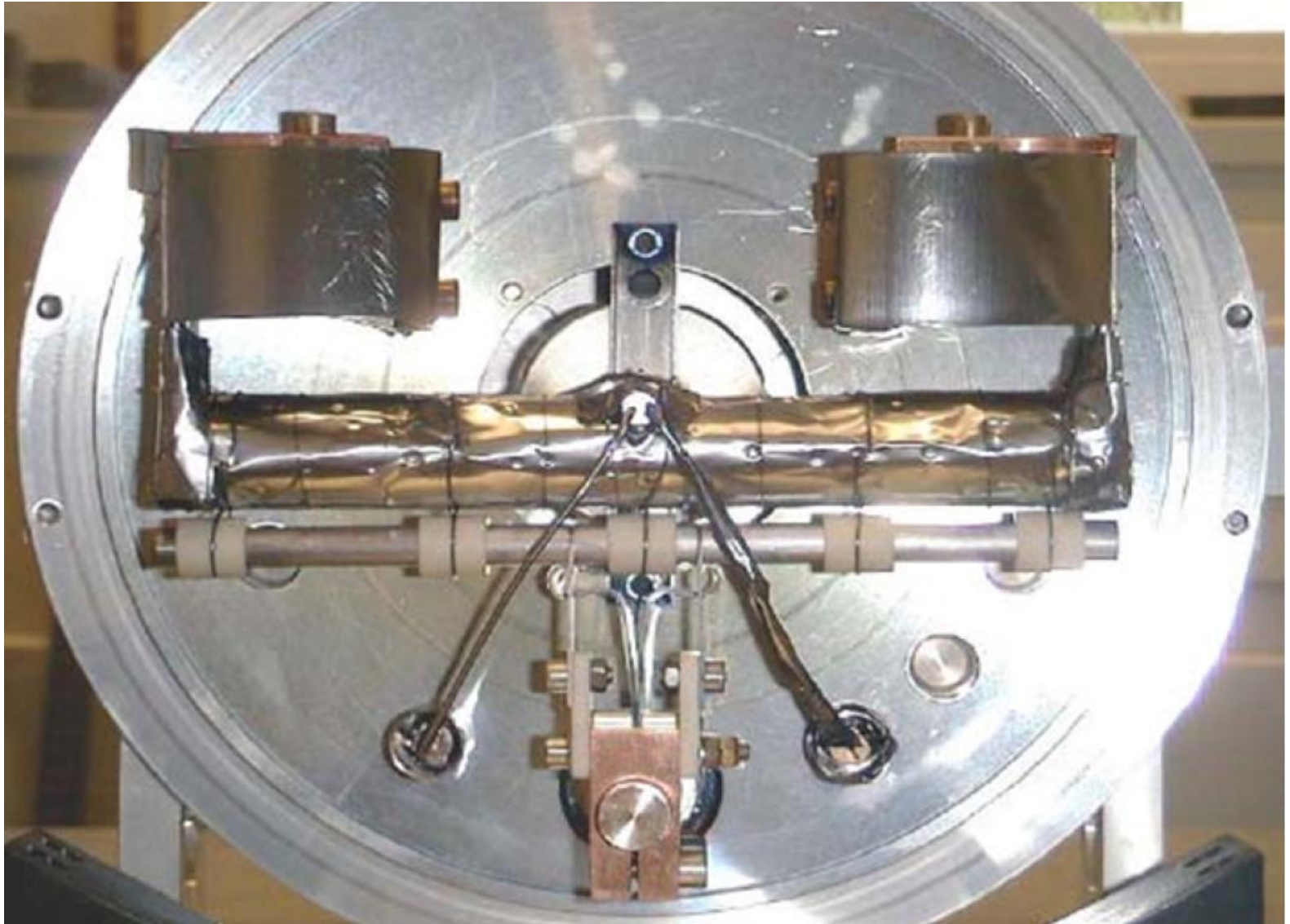
ISOLDE target

In position



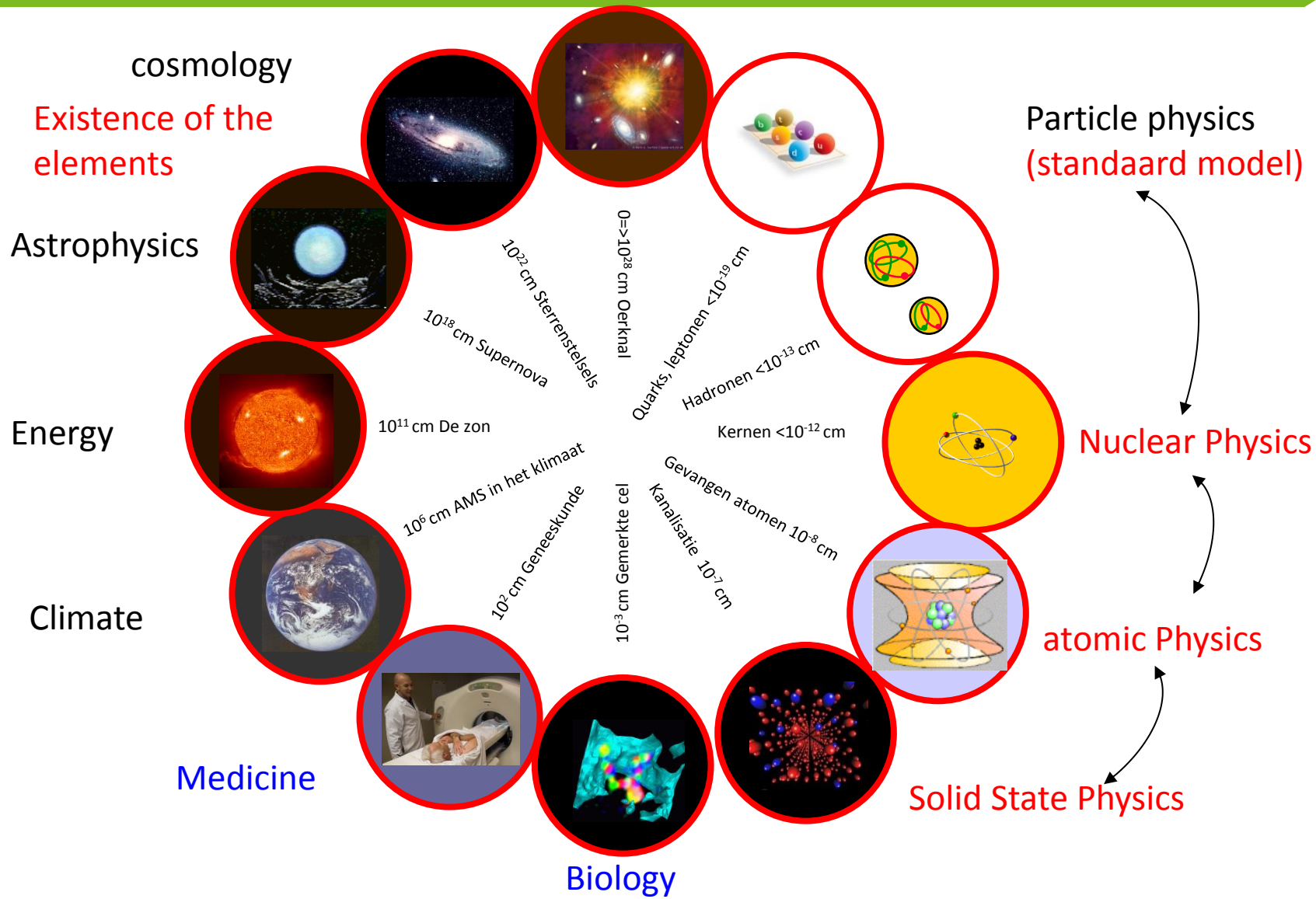
ISOLDE target

Proton on target or on the neutron converter



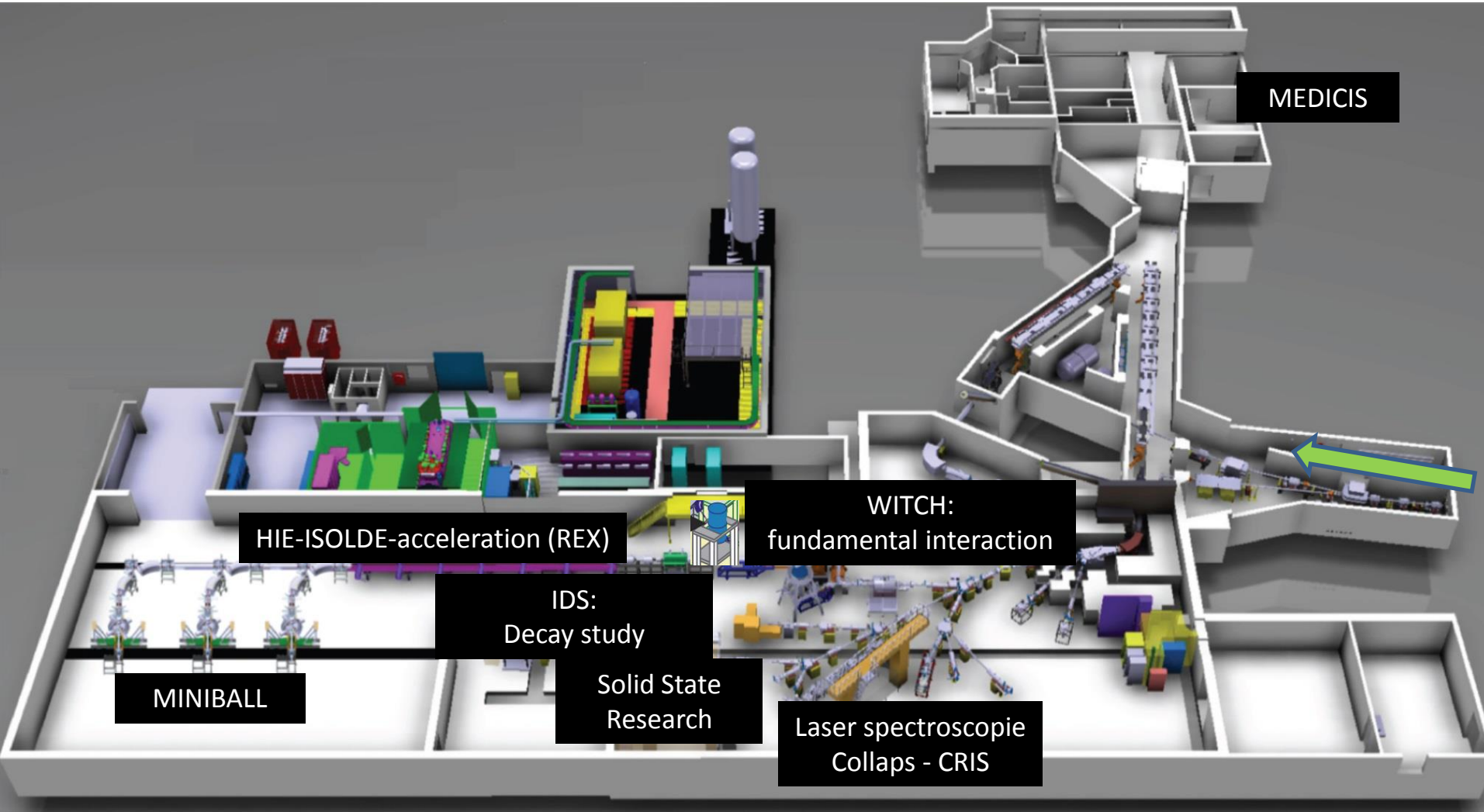
Research with Radioactive Beams

Why?

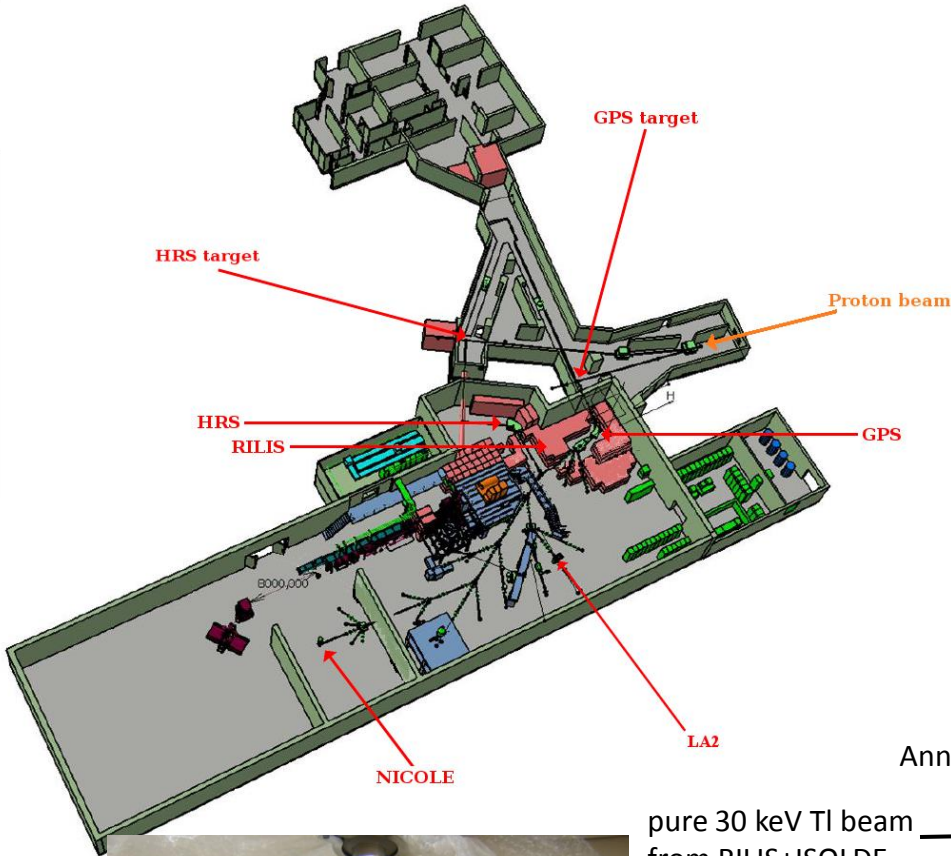


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Isotope Separator On-Line DEvice



β -spectroscopy: Previous Experimental Setup

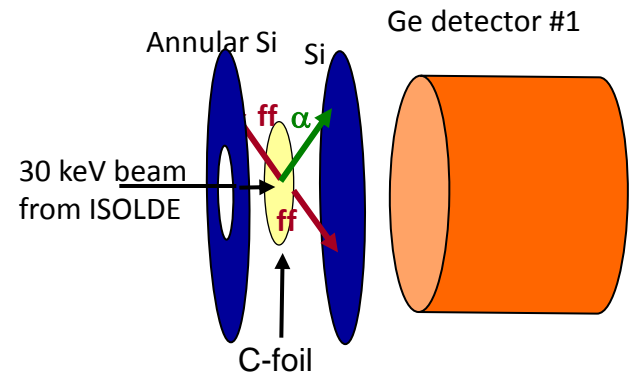
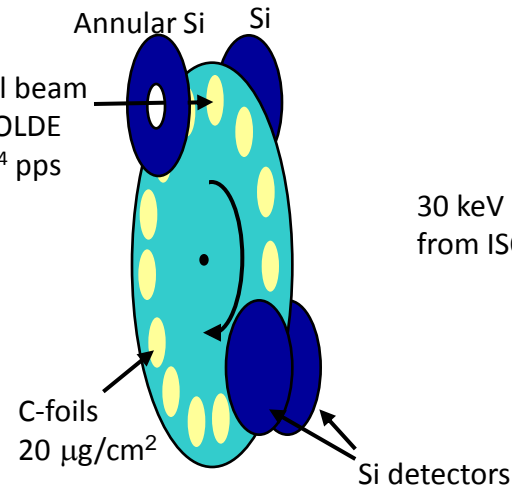


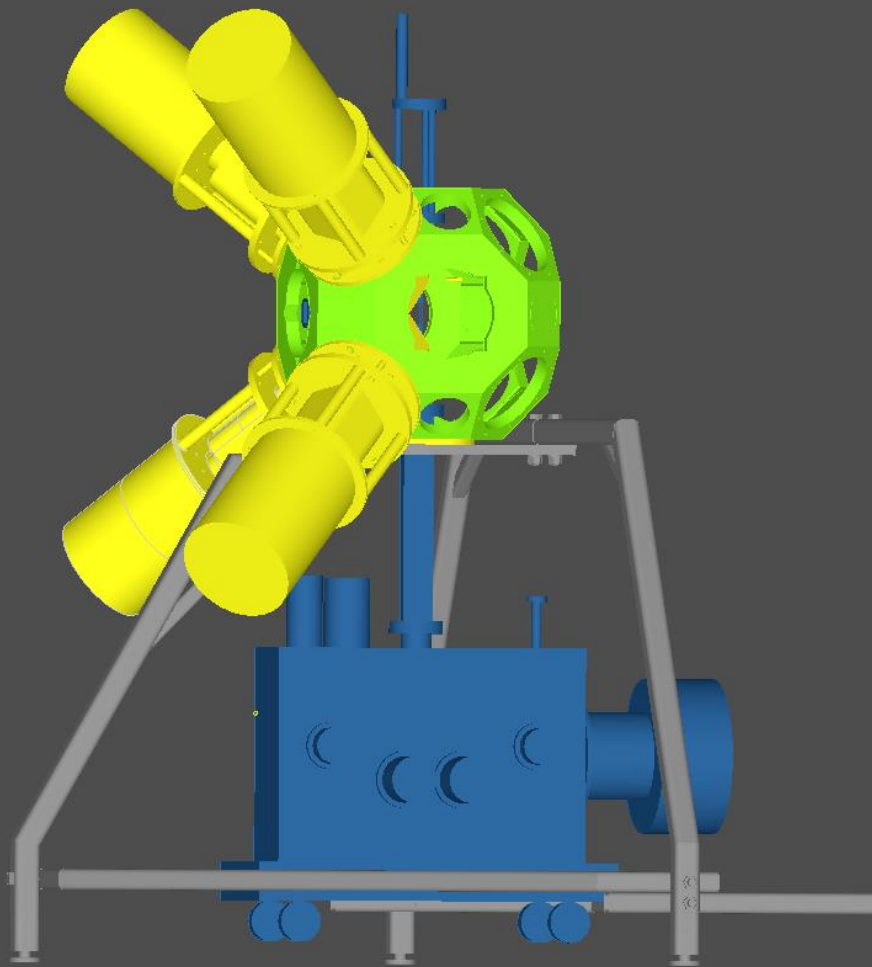
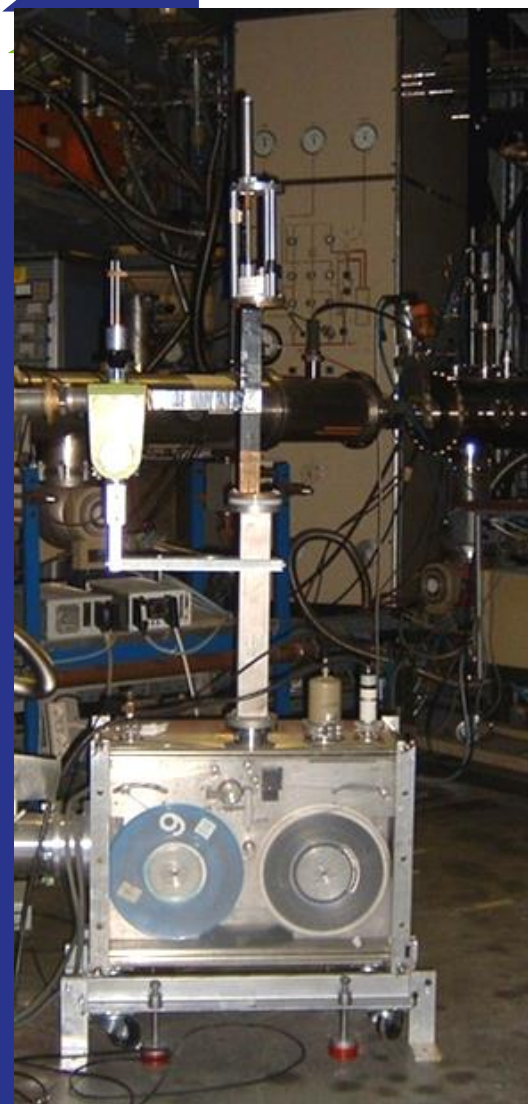
Courtesy of T.E.Cocolios



Windmill Chamber

pure 30 keV TI beam
from RILIS-ISOLDE
Intensity = 10^4 pps





Possible Projects

- Installation of the apparatus started in Feb 2014
- Beam line modification is going on;

- AUTOCAD technical drawing of the new beam line and the experimental area
- Beam optical simulations of the latest part of the beam line (Switchyard + three quadrupoles) (MADX and Simion software)

Ongoing work in coming months:

- Install detectors frame (hands on)
- Install an automatic Refill system of Liquid Nitrogen for the Germanium detectors (hands on)
- Test Germanium detectors (set up a simple 1-channel data acquisition system)
- Commission Tape station and ancillary detectors (hands on)

Team: you will join a small group of 3 to 5 persons (locally 2 Senior Post-Doc, 1 PhD student)

goal: be ready for first decay experiment end July 2014