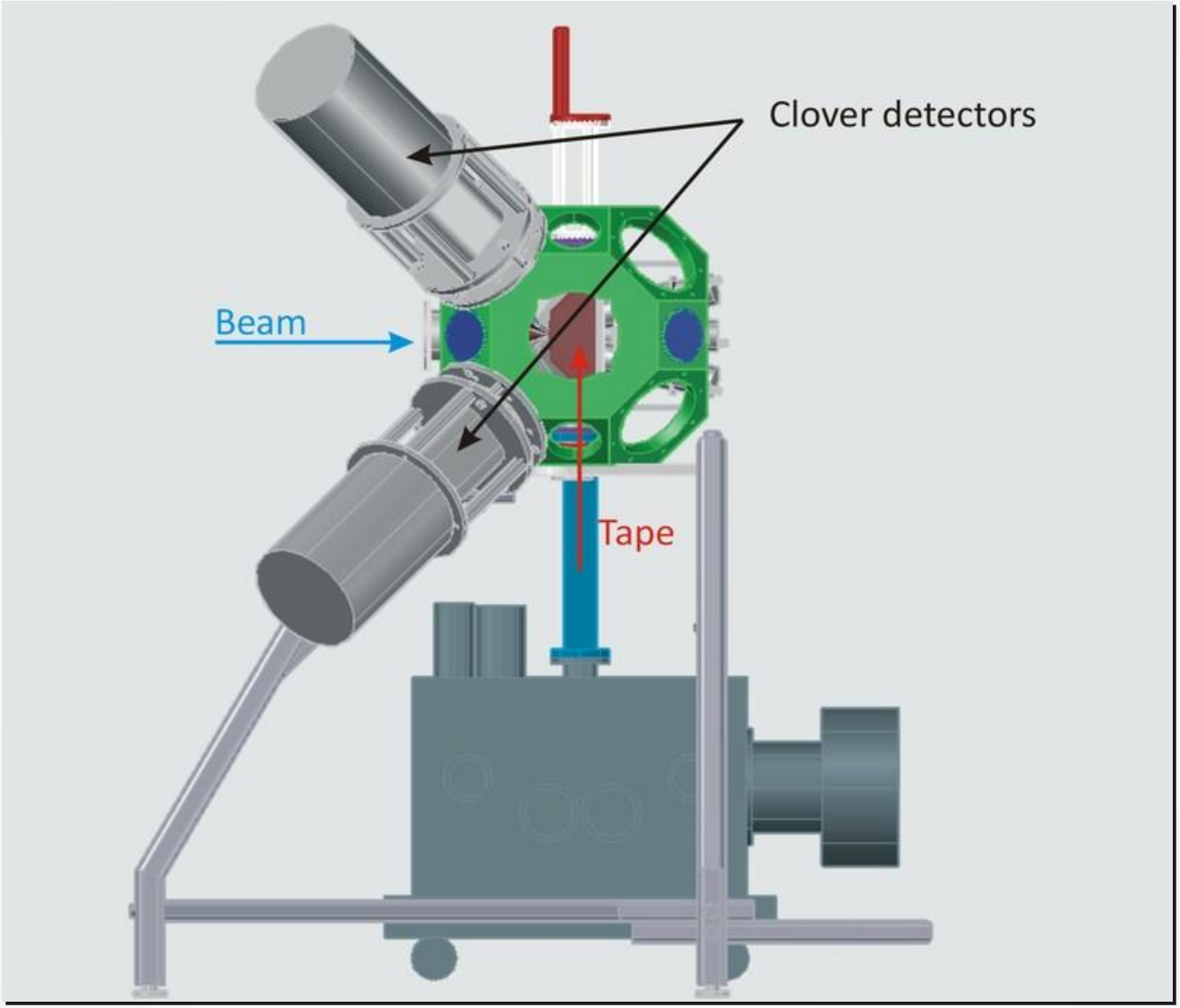
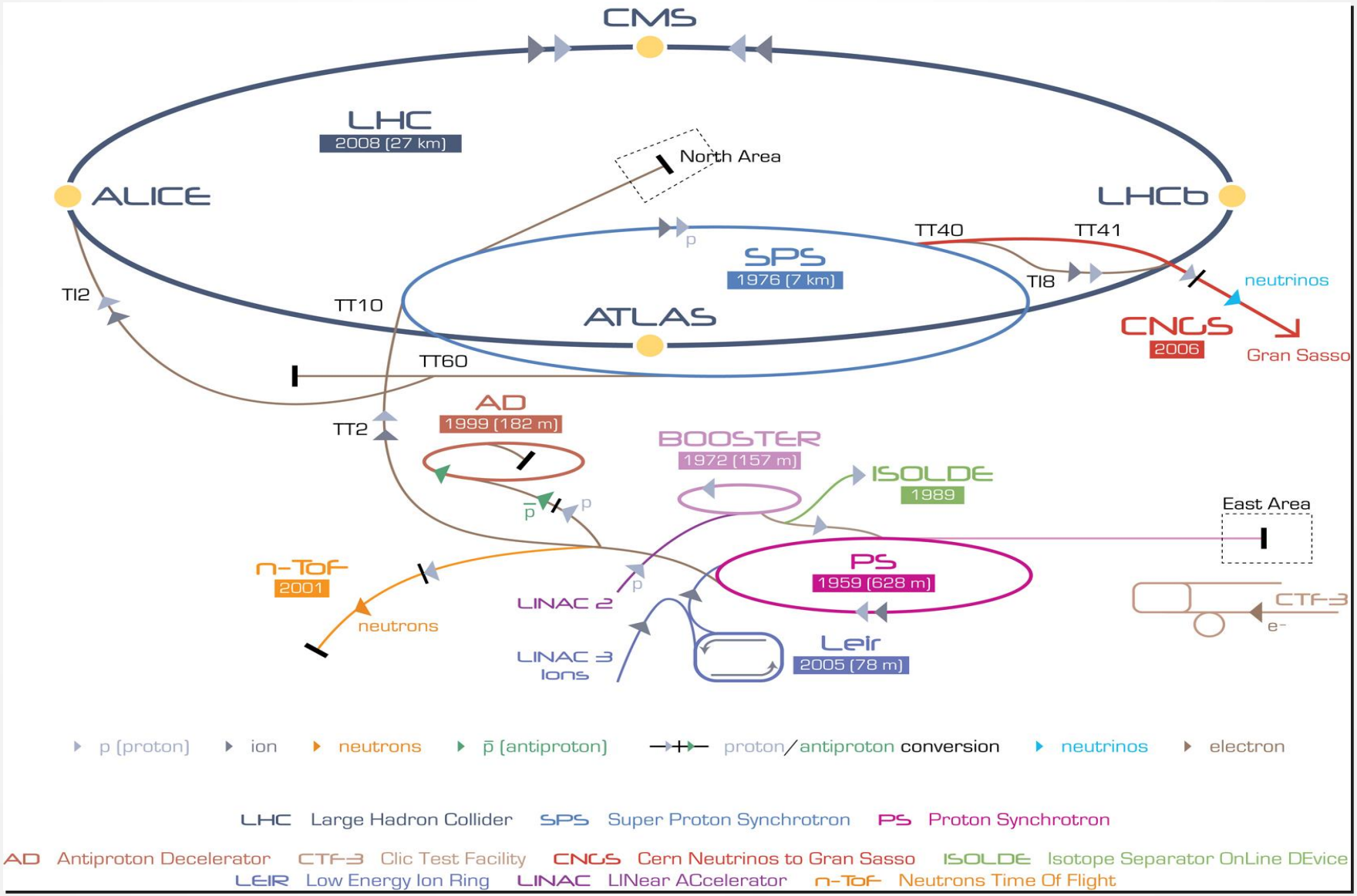
ISOLDE Decay Station



Isolde facility



Isolde focuses on nuclear physics experiments

- We study

$$^{222}_{88}\mathrm{Ra} \longrightarrow {}^{4}_{2}\mathrm{He} + {}^{218}_{86}\mathrm{Rn}$$

$$^{14}_{6}\mathrm{C} \longrightarrow {}^{14}_{7}\mathrm{N} + {}^{0}_{-1}\mathrm{e} + {}^{0}_{0}\bar{\nu}$$

$$^{A}_{Z}\mathrm{X}^{*} \longrightarrow {}^{A}_{Z}\mathrm{X} + \gamma$$

Semi-Empirical mass formula

$$E_B = a_V A - a_S A^{2/3} - a_A \frac{(A-2Z)^2}{A^{1/3}} - a_C \frac{Z(Z-1)}{A^{1/3}} + \delta(A,Z)$$

Volume term | Surface term | Asymmetry term | Coulomb term | Pairing term

For pairing term:

$$\delta(A,Z) = \begin{cases} +\delta_o & \text{A, Z even} \\ 0 & \text{A odd} \\ -\delta_o & \text{A, Z odd} \end{cases}$$

where

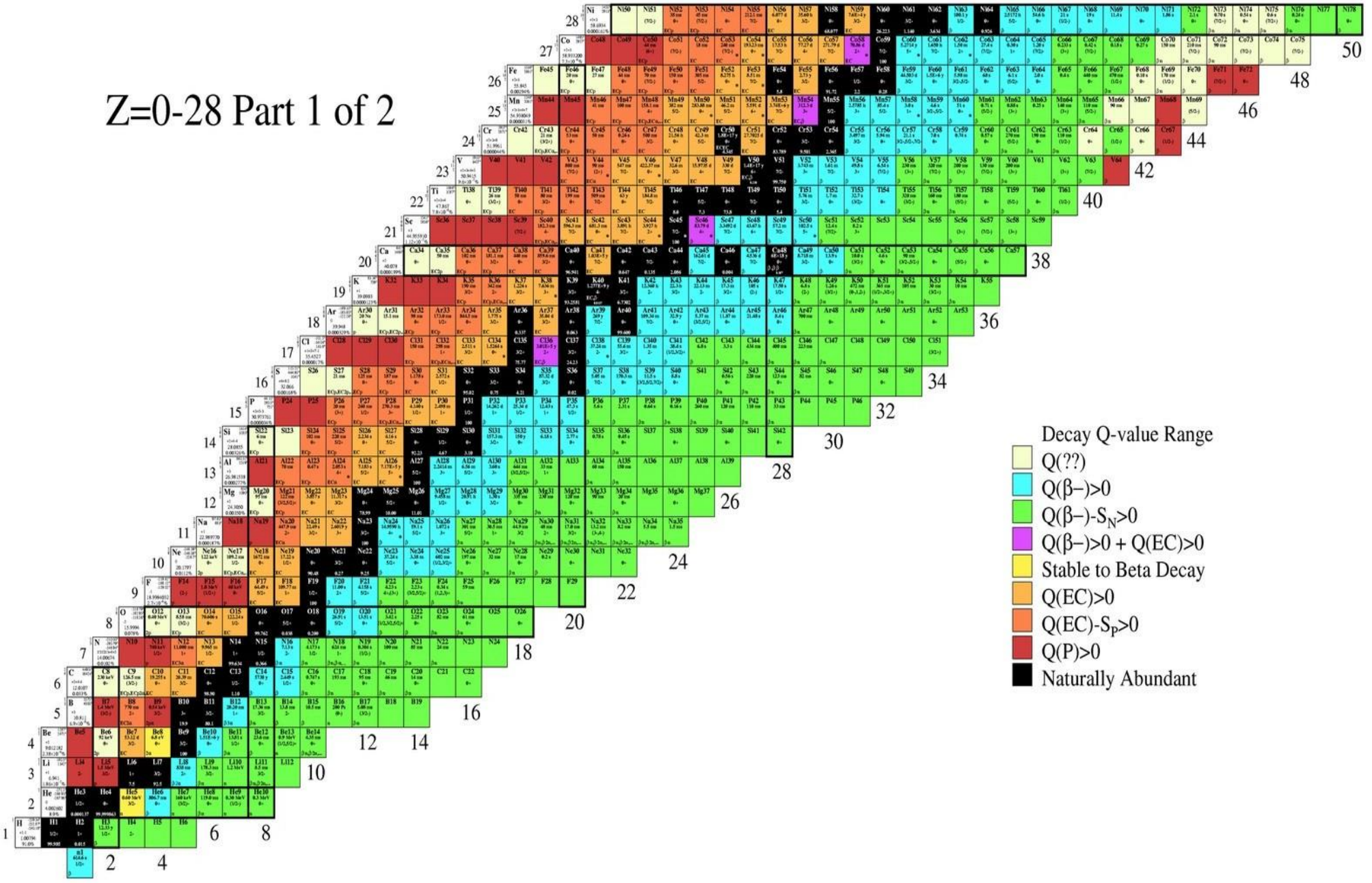
$$\delta_o = \frac{a_p}{A^{1/2}}$$

Coefficients:

$a_V = 15.85$ MeV
$a_S = 18.34$ MeV
$a_A = 23.21$ MeV
$a_C = 0.714$ MeV
$a_p = 12.00$ MeV

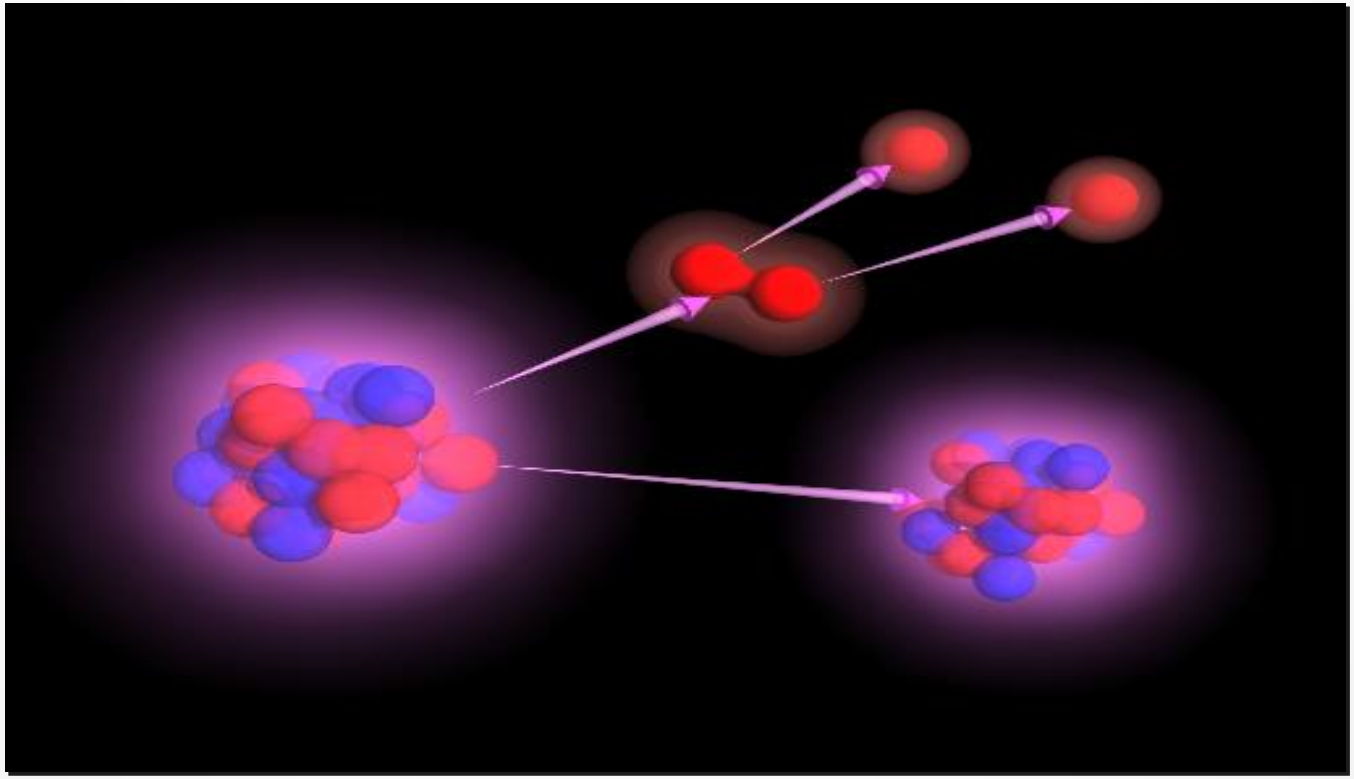
Table of Isotopes (1999)

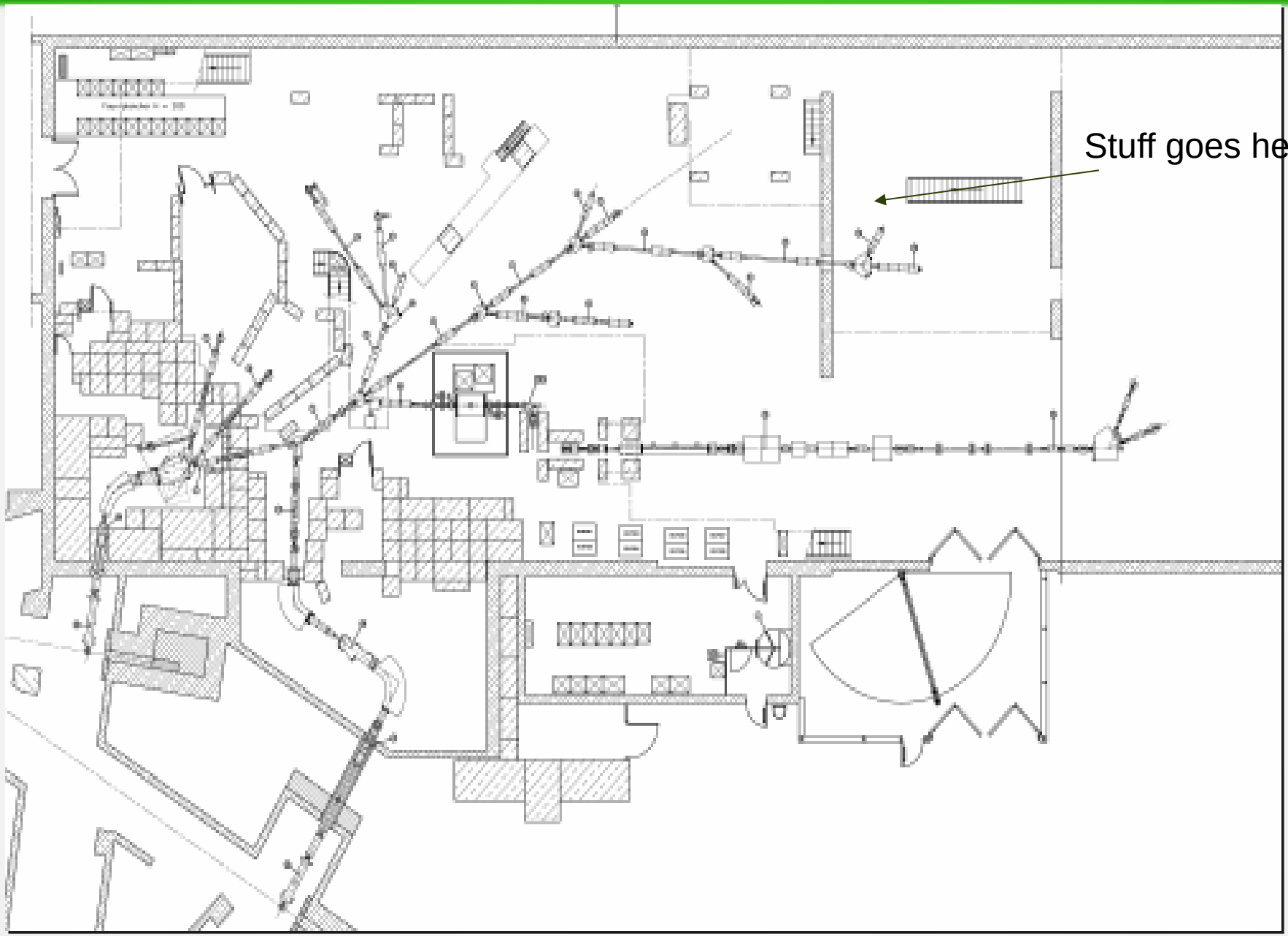
Z=0-28 Part 1 of 2



Creating exotic nuclei

- The ion beam knocks nucleons from the Uranium nucleus. This creates unstable (“exotic”) nuclei with either too many protons or too many neutrons. The nuclei decay quickly and their decay is measured by the various detectors in IDS.

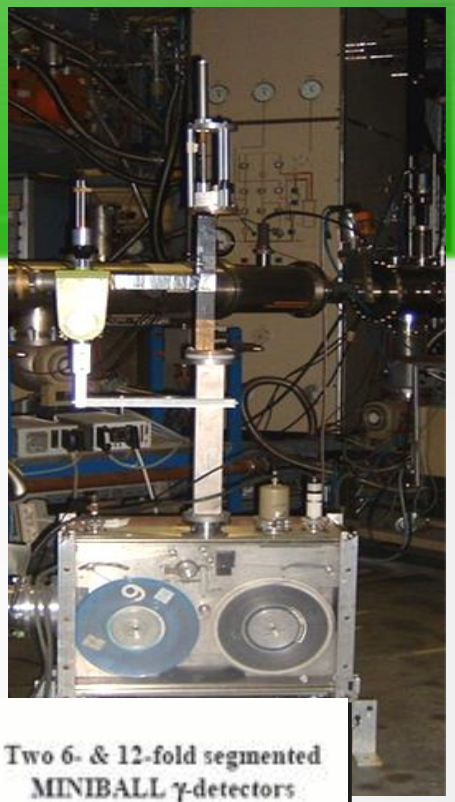



Stuff goes here

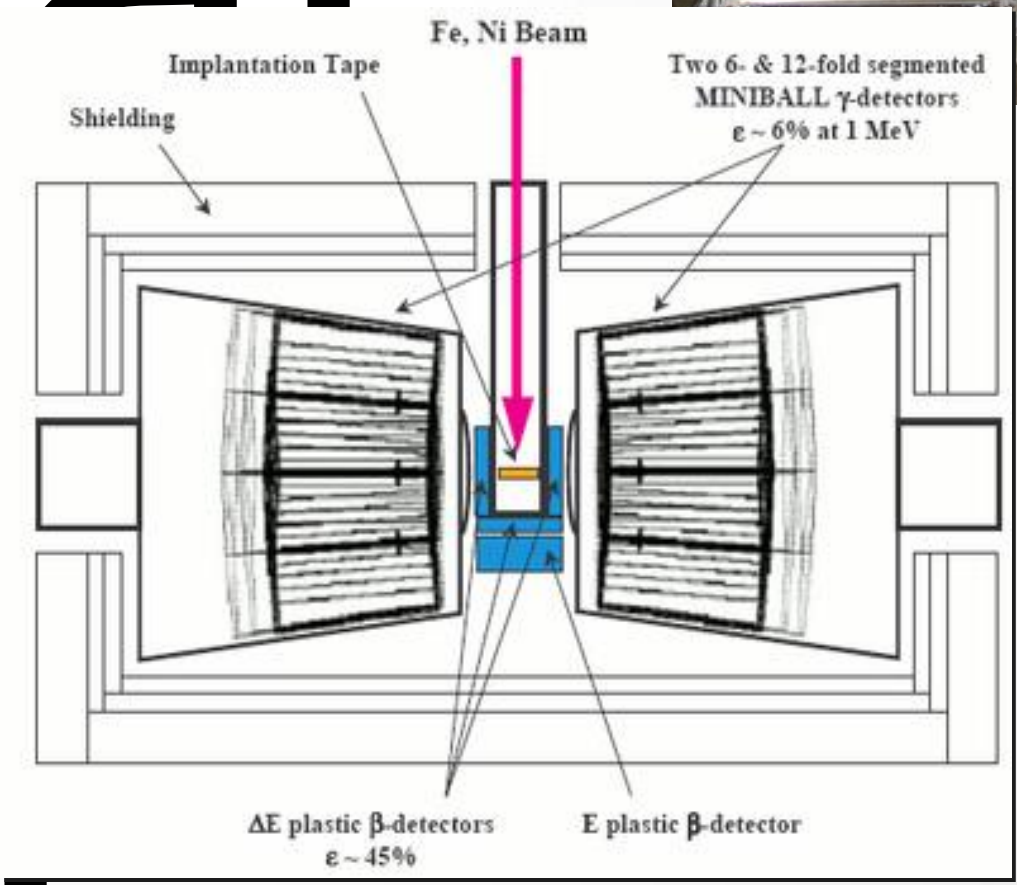
IDS components

- Clover detectors
- Miniball
- Silicon detectors
- Tape station

Tape Station

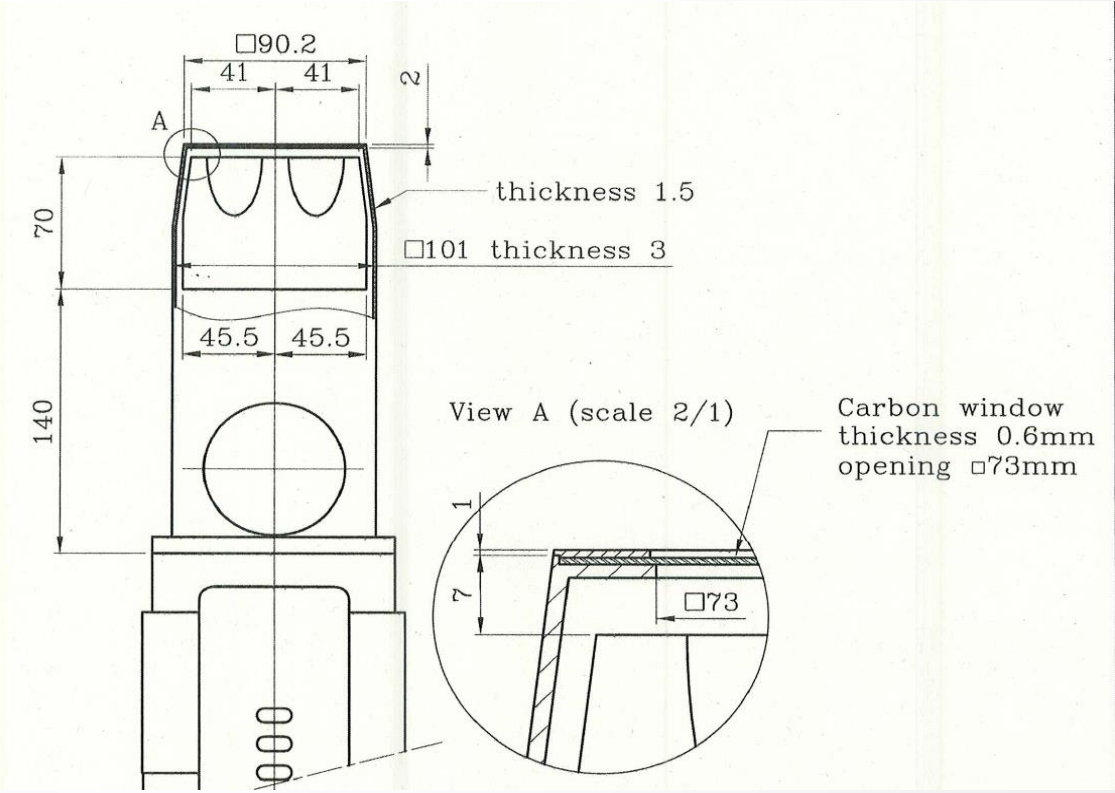


- Mylar tape



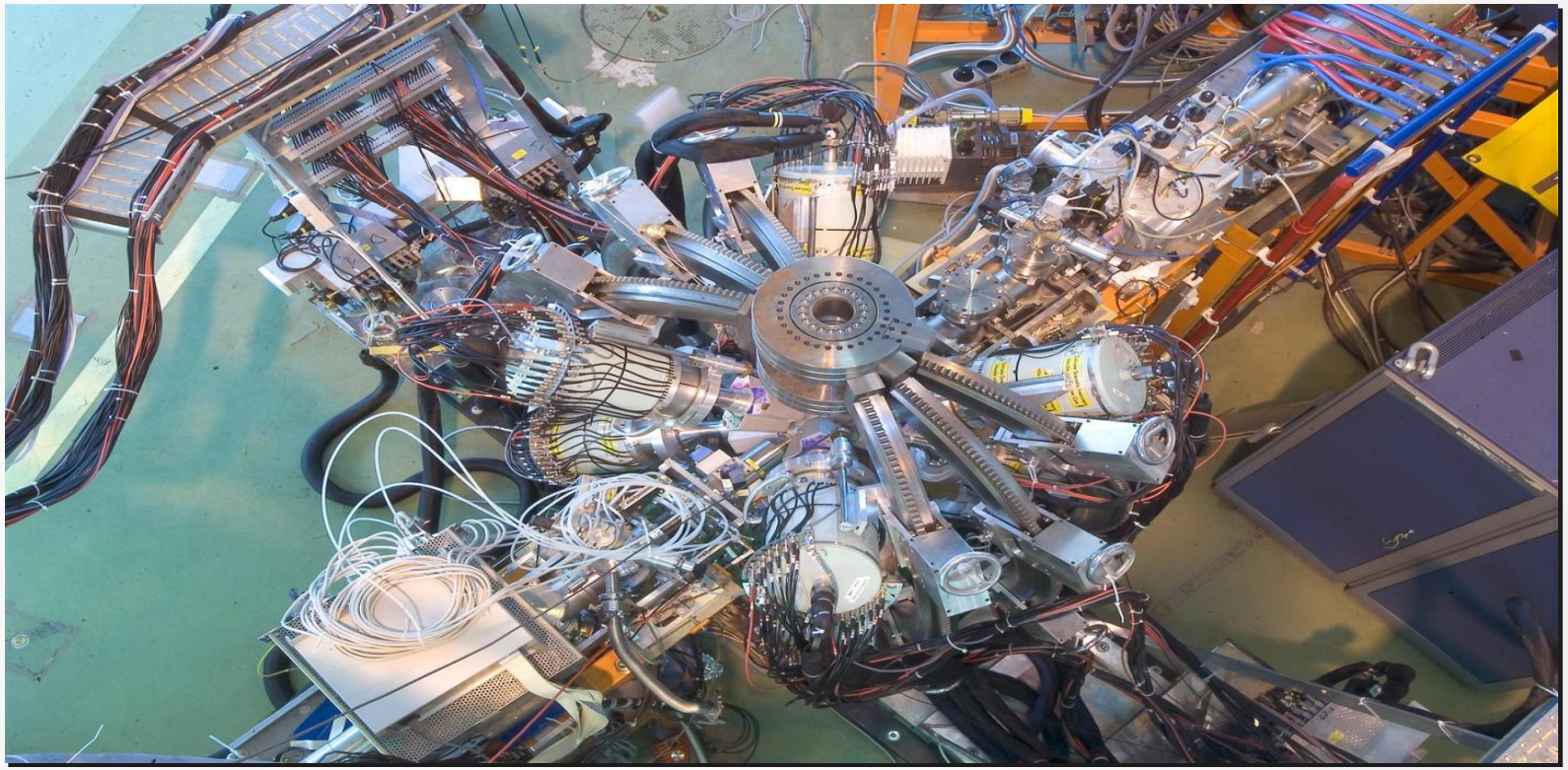
Clover Detectors

- Made of high purity germanium crystals
- Used to detect gamma radiation
- Works in a similar way to ccd where gamma rays knock electrons so the total charge is proportional to the energy of the gamma rays



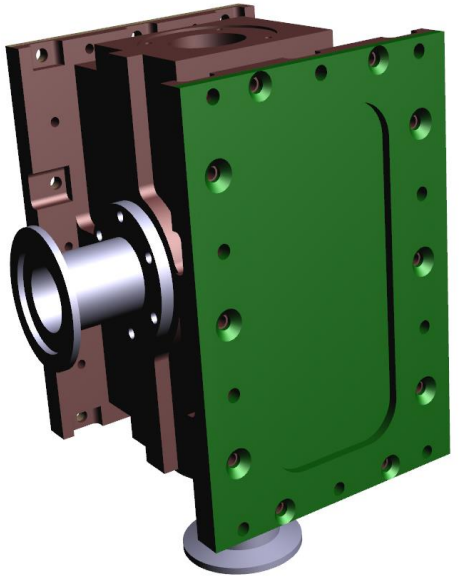
Miniball

- Another Germanium detector, similar to clover, very high efficiency, useful for lower energy, low electron- multiplicity experiments

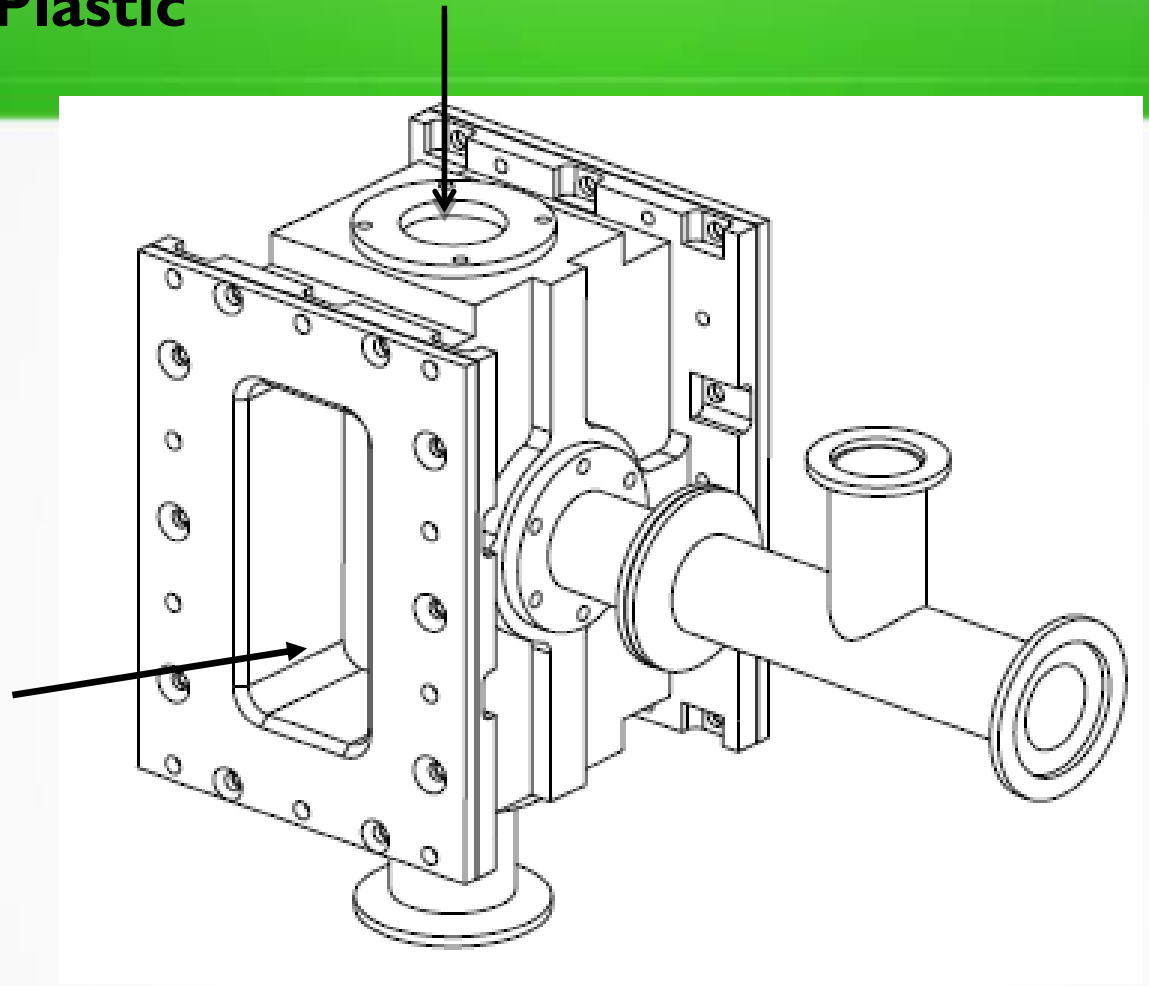


Silicon Detectors

- Used to detect alpha pa and larg fission



Plastic



Si det

Beam

Tape

LaBr3 Scintillator

- A Scintillator is a device that fluoresces when struck by ionizing radiation. It remits absorbed radiation in the form of visible light
- In nuclear experiments, it is used to measure gamma radiation
- Lanthanum Bromide has the advantage of higher energy resolution but at the cost of more background noise, so it is better suited to relatively high energy experiments where the backround noise is less noticeable.

Goals for the semester

- CAD drawing,update schematics
- Setting the station as the parts arrive from various manufacturers

Questions?

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Pictures

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