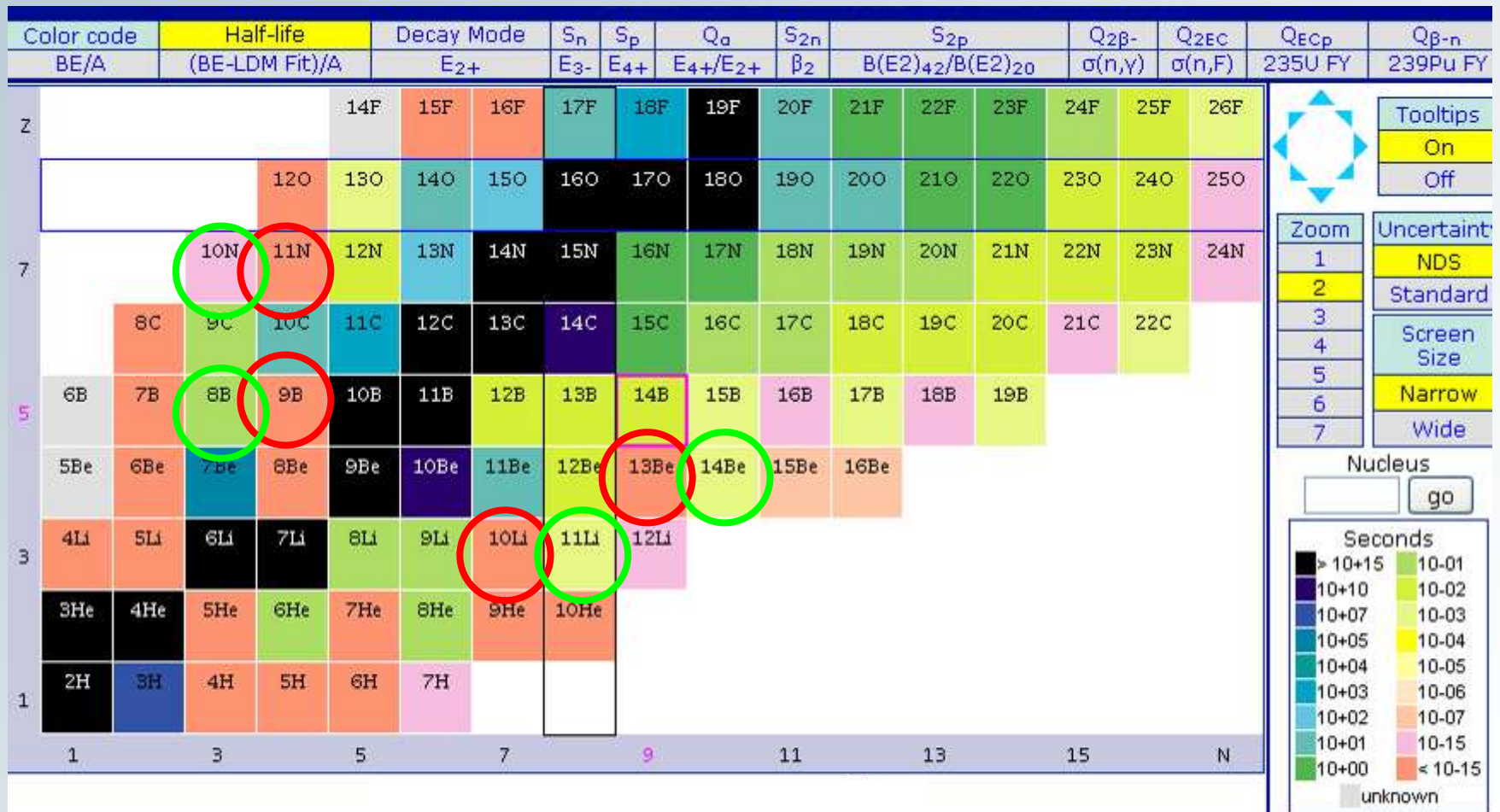


Study of light nuclei near drip lines

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There are many unstable nuclei - seen only as **resonances** - from which adding/removing a neutron you can get a “**relatively long life**” nucleus



We will use transfer reactions in order to populate the resonances and/or nuclei near to them - Transfer reactions will be also used to evaluate the existence of halo structures

p and d targets will be used in order to get reactions like one neutron transfer (d,p) or pick-up (p,d) (p,t) (d,t) but also other channels will be investigated like (p, ^3He) or (d, ^3He)

We are investigating also on the availability of t targets

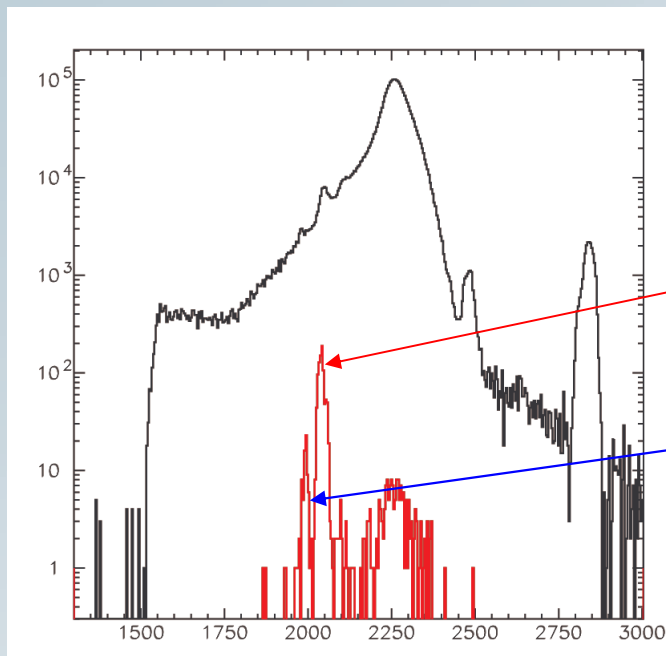
In all these reactions we will take advantage of the use of CHIMERA and of the Two Body Kinematic (TBK) method

Detecting both projectile and target of a binary reaction we can clean the background - improve the angular resolution of the detection system - discriminate excited levels - and in some cases detect and identify also neutrons

The “Two Body Kinematic method” : cleaning background

The 95% efficiency of CHIMERA and the low detection threshold allow to detect both reaction partners in binary reaction reducing very much the background - one of the main problems with radioactive beams

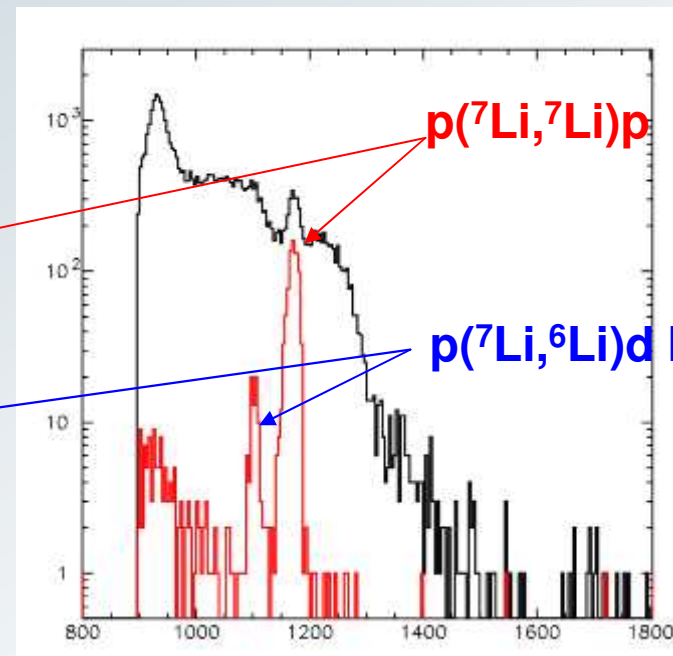
A simple example can be provided by the study of the reaction ${}^7\text{Li}+p$ (52 MeV) using a plastic target we have large background due to the reaction on ${}^{12}\text{C}$



Tel 40 ($\theta=3.1^\circ$) silicon energy

Take two
detectors
with
 $\Delta\phi=180^\circ$

Select only
events in
coincidence

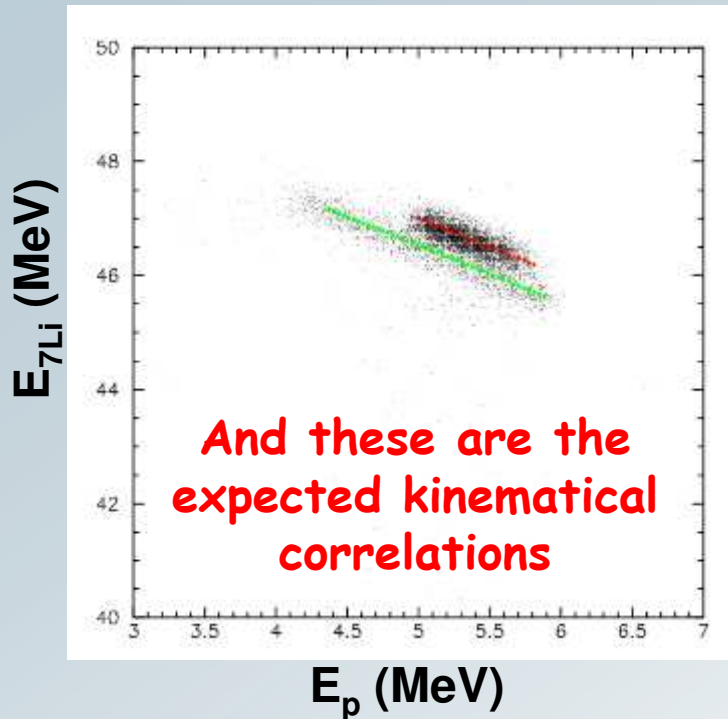


Tel 178 ($\theta=7.8^\circ$) Csl(Tl) energy

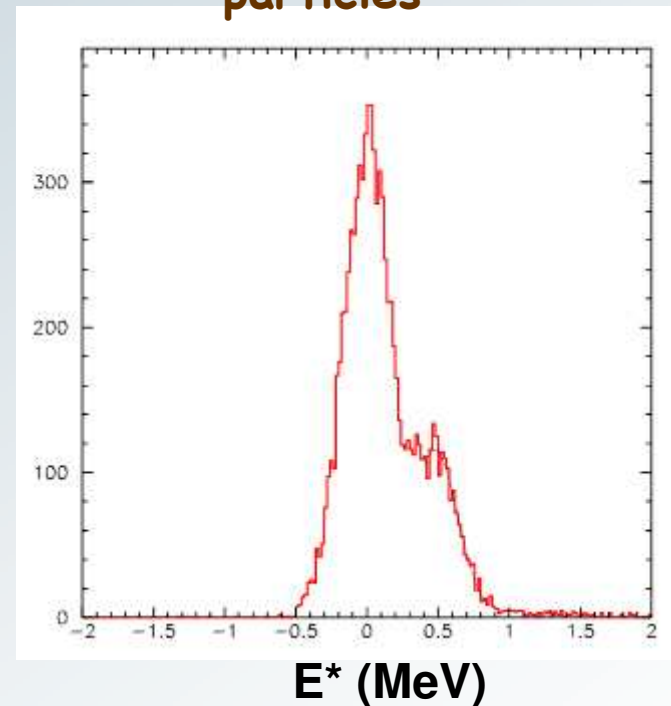
4 order of magnitude background rejection - spectra “background free” - further background rejection considering fast-slow pd discrimination - mass & charge measurements with TOF and Pulse shape analysis of silicon detector

The “Two Body Kinematic method” : excited level discrimination

This is the $E_{7\text{Li}}-E_p$ plot

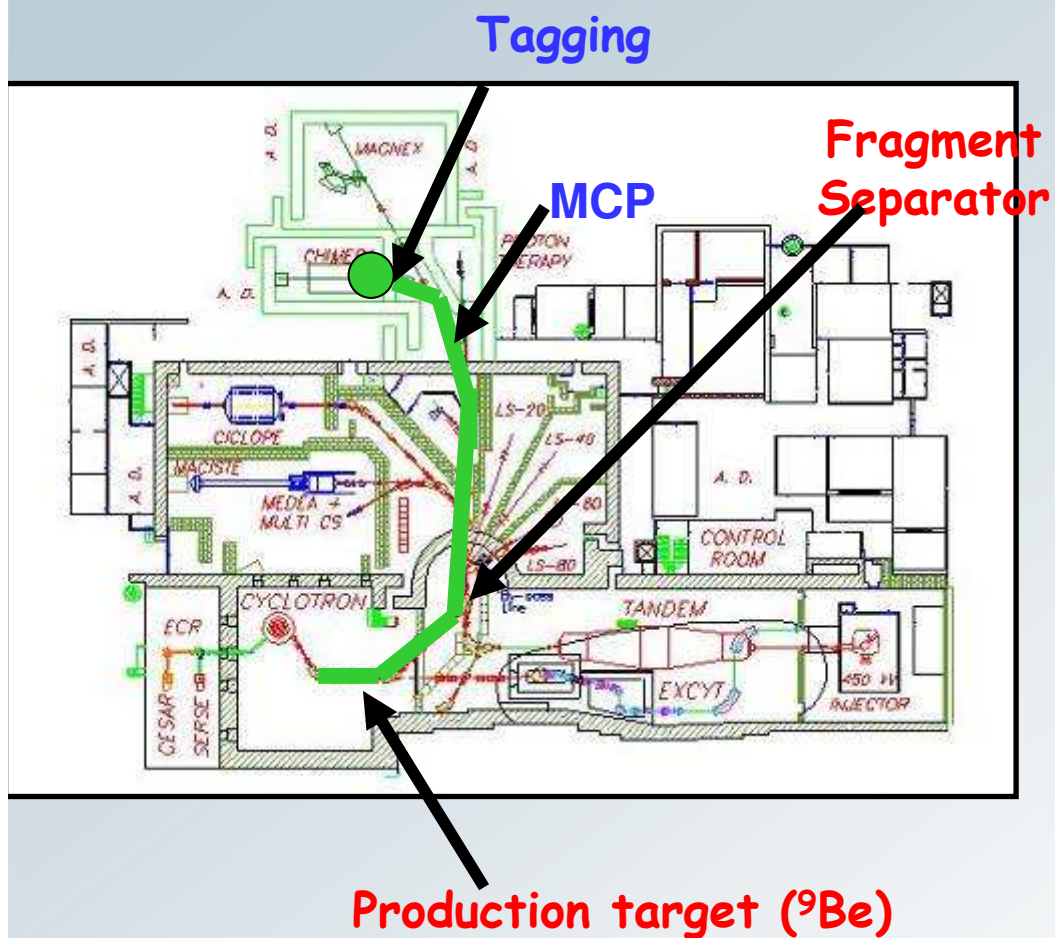


We can very simply calculate the excitation energy subtracting to the beam energy the energy of detected particles



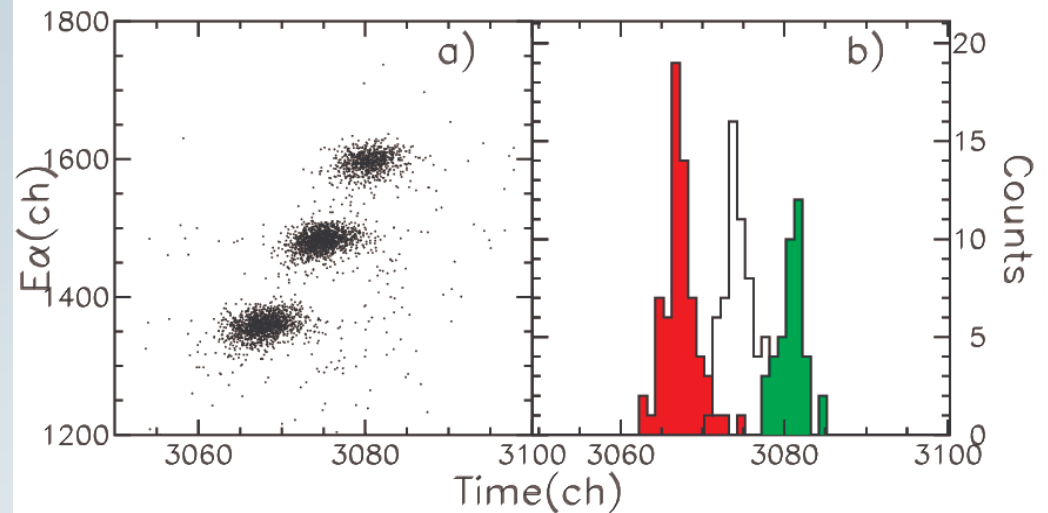
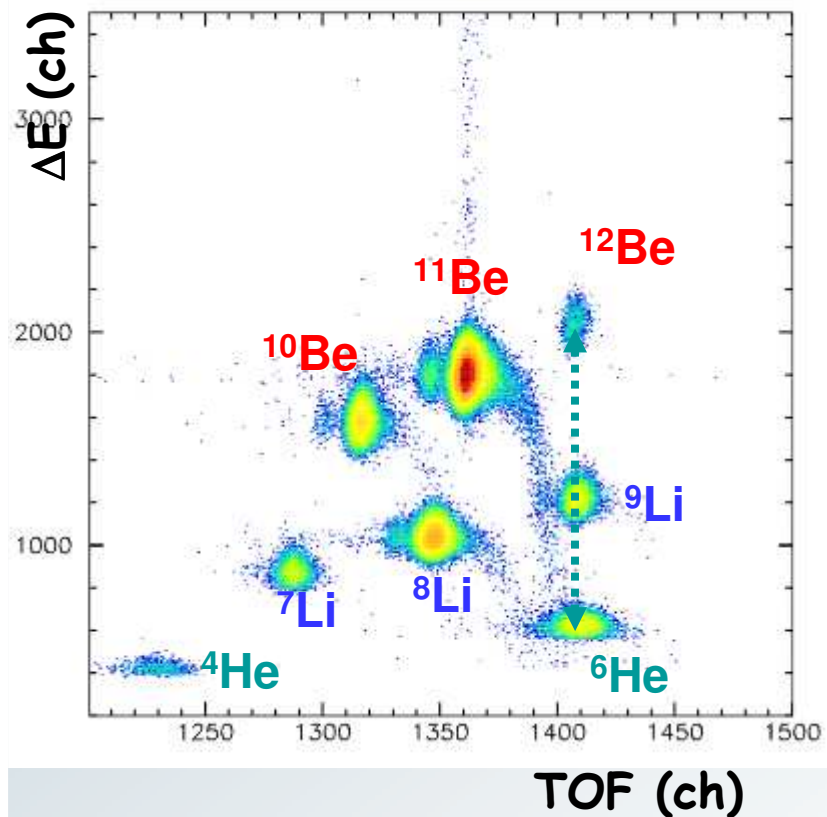
Selecting both p and ${}^7\text{Li}$ stopped in our silicon detectors we have a quite good energy resolution - we see very well the p, p' reactions at the first excited level of ${}^7\text{Li}$ (0.47 MeV)

The CHIMERA tagging system



Quality of the tagging system

TEST with alpha-source seen by
MCP & DSSSD



ΔE -TOF identification scatter plot

USING

^{13}C 55 MeV/A primary beam on 1.5 mm
 ^9Be we are able to produce ^{11}Be (up to
20 kHz with 100 Watt primary beam)

THE second LOI By M.Papa