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First results of reactions induced by exotic beams in the region of ^{11}Be with CHIMERA array

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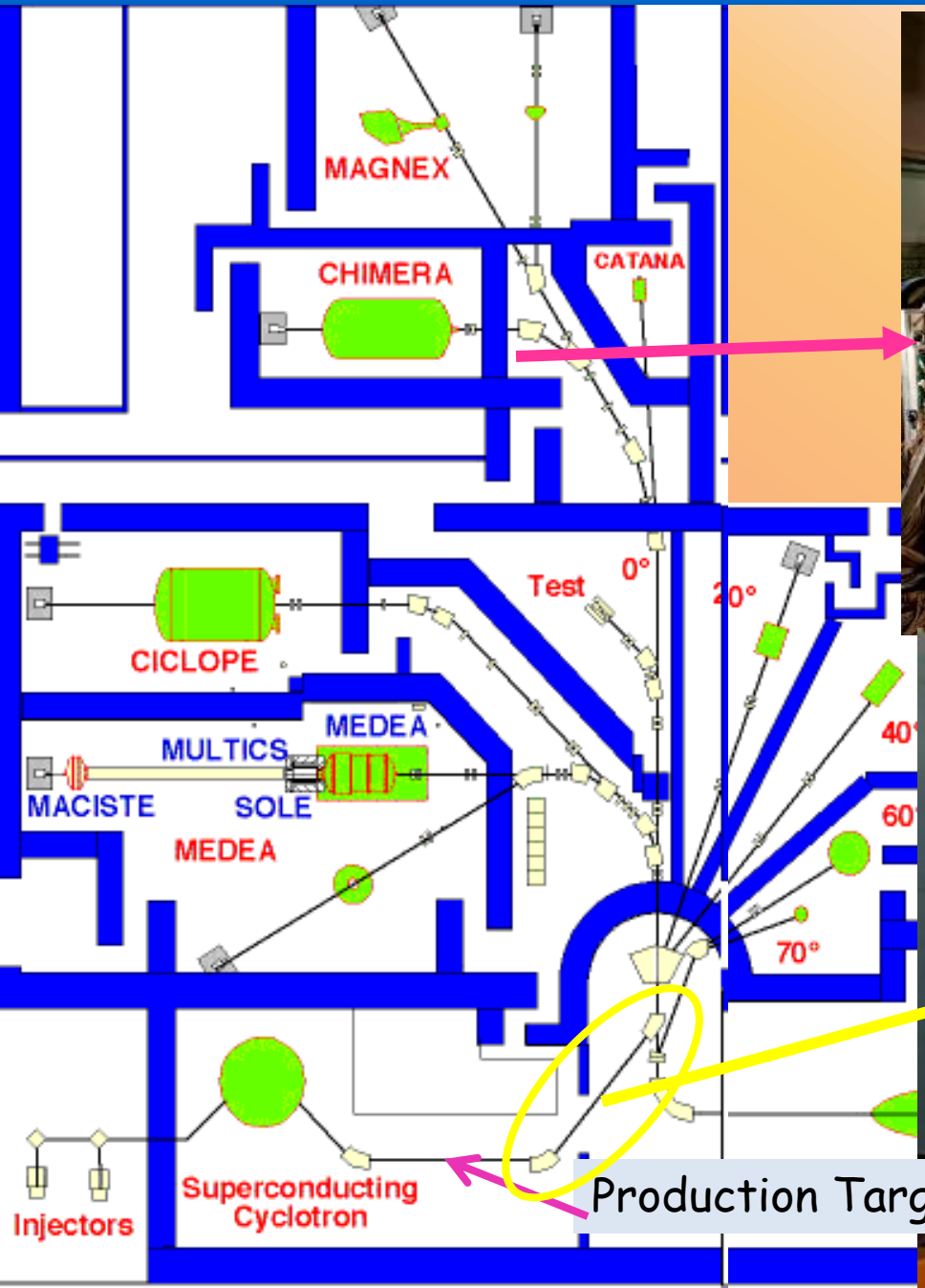
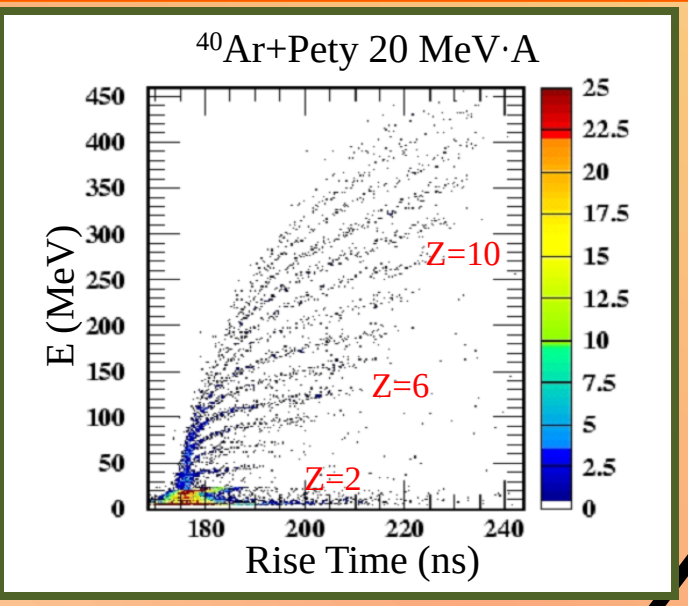
OUTLINE

- Fragmentation beams at LNS
- Chimera characteristics and detection techniques
- Tagging system
- First experiments with ^{13}C, ^{16}O, ^{18}O primary beams at 55 MeV/A
- Kinematical coincidence technique and its capabilities
- Preliminary and incoming results

Fragmentation beams at INFN-LNS in Catania



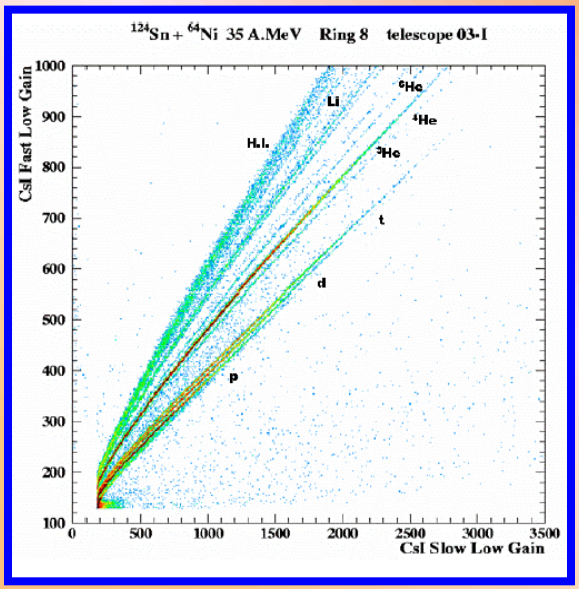
CHIMERA Detection Techniques



Si CsI(Tl)

PSD Si

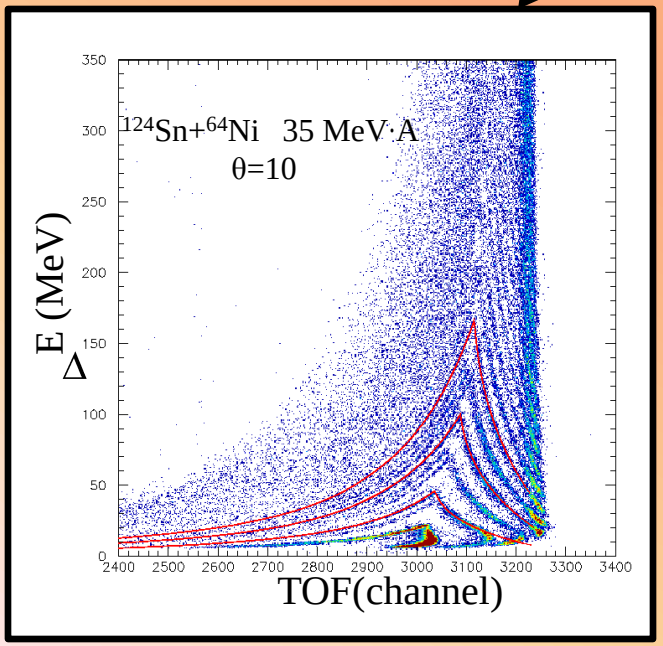
PSD CsI

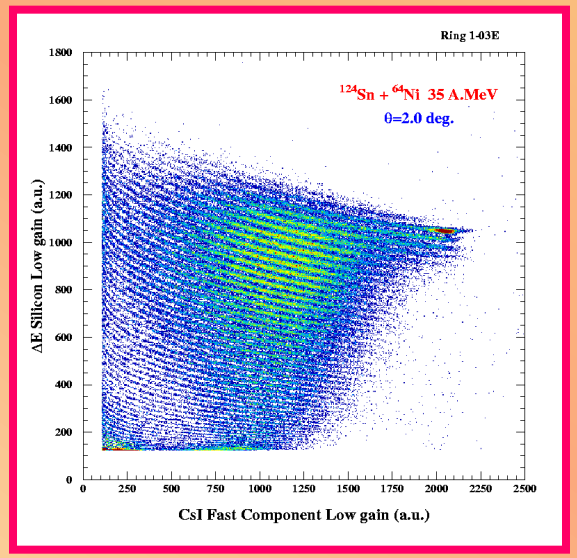


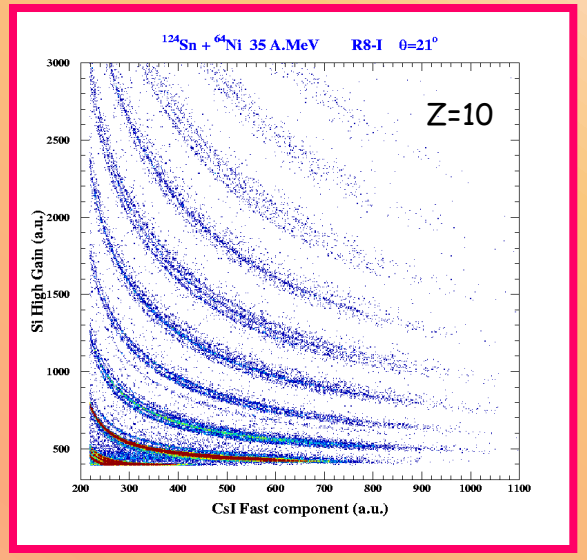
ΔE-E

TOF

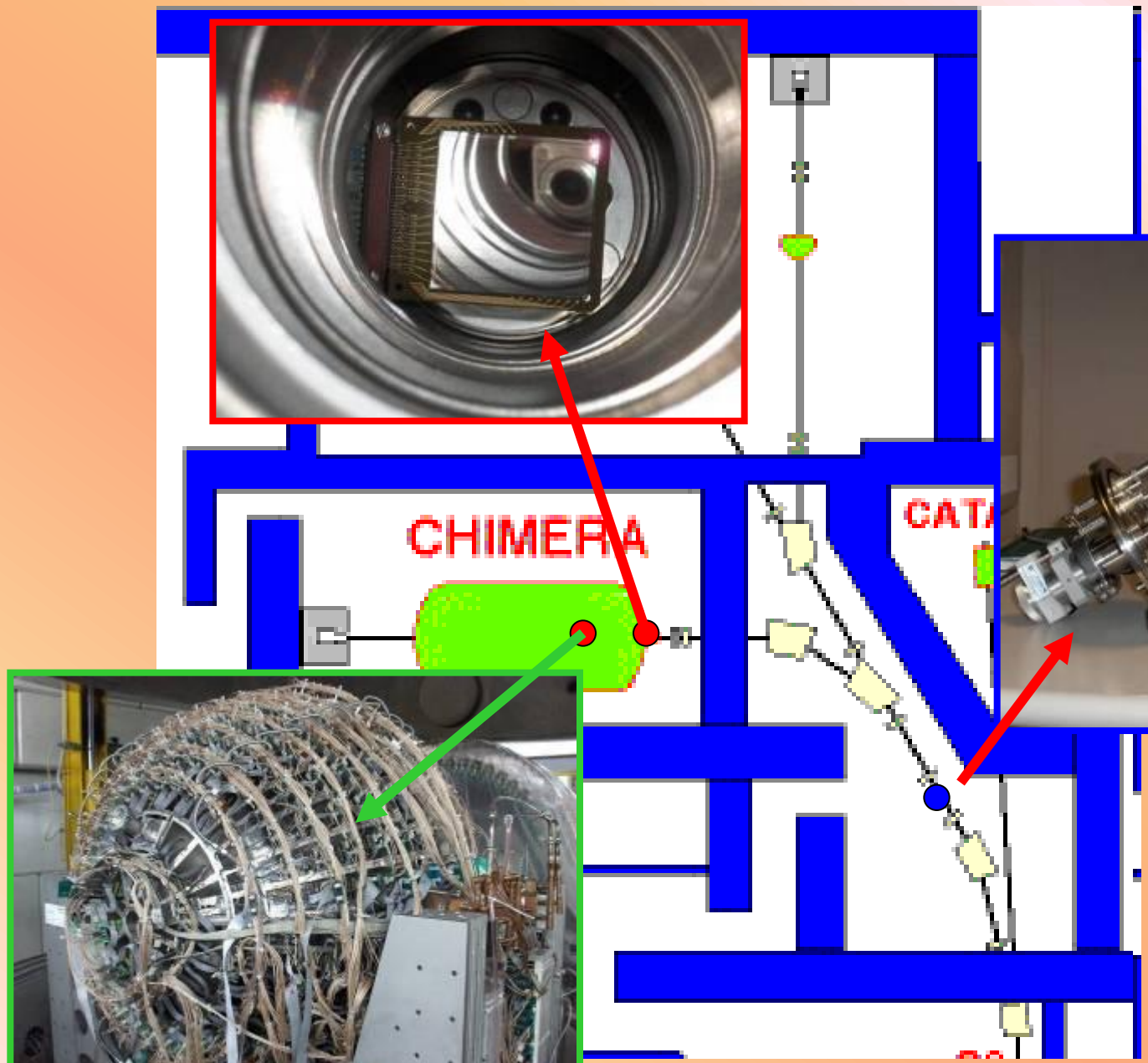
TOF-E







Fragmentation Beams Tagging System

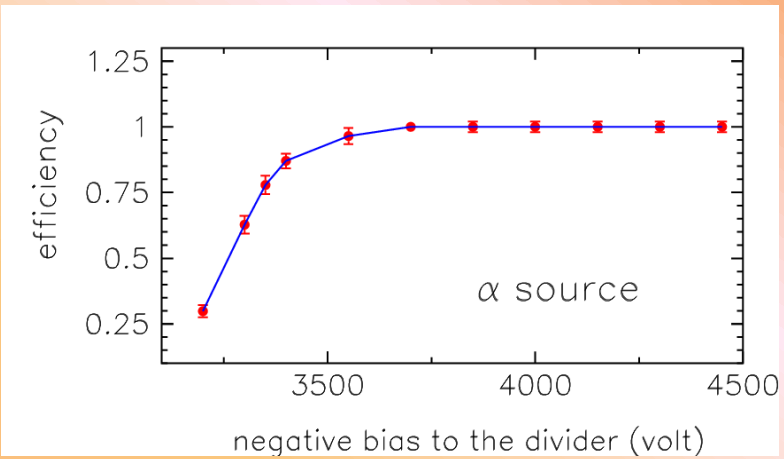


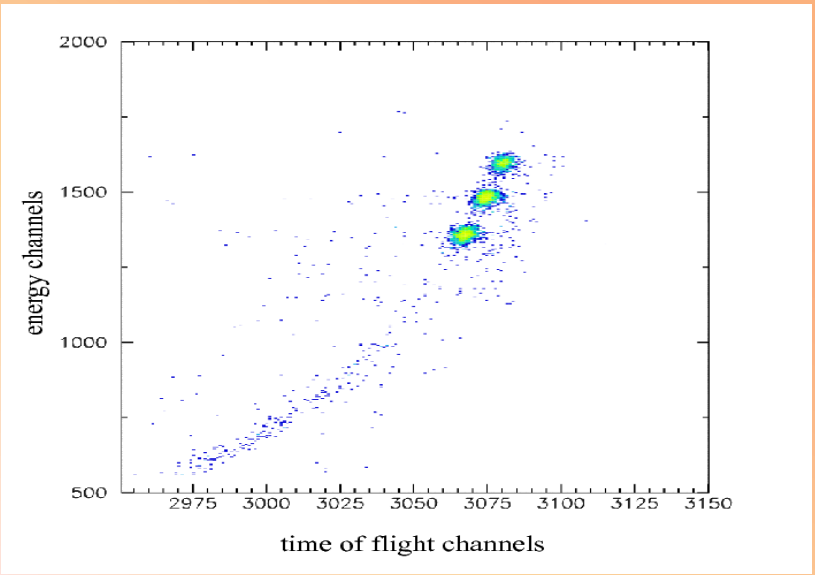
Tagging System test with α–source

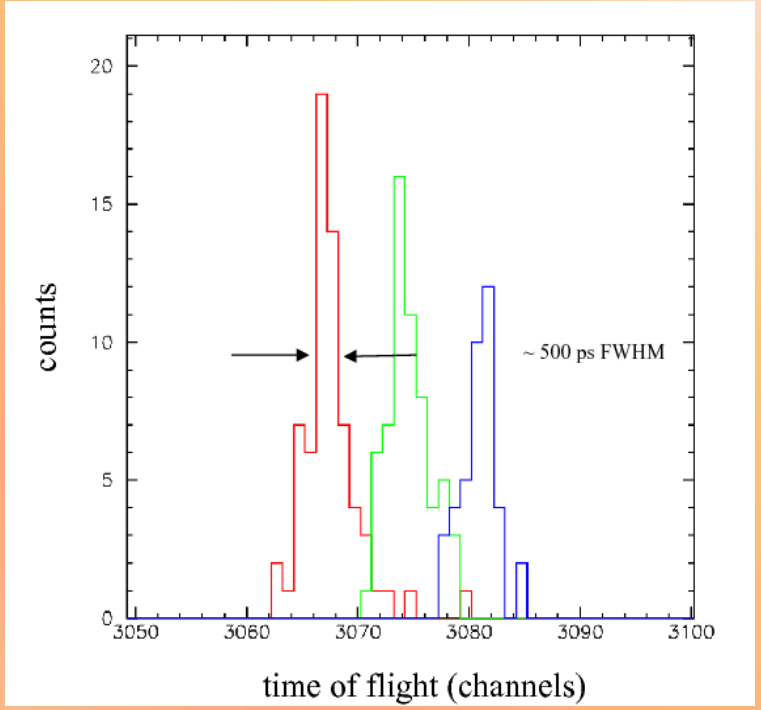
At the entrance of the CHIMERA scattering chamber, we mounted α–source, MCP and DSSSS (16x16 strips, thickness 140 μm).

The base of flight is 70 cm

By using coincidences between MCP and one pixel in the silicon detector, we obtain a time resolution better than 500 psec

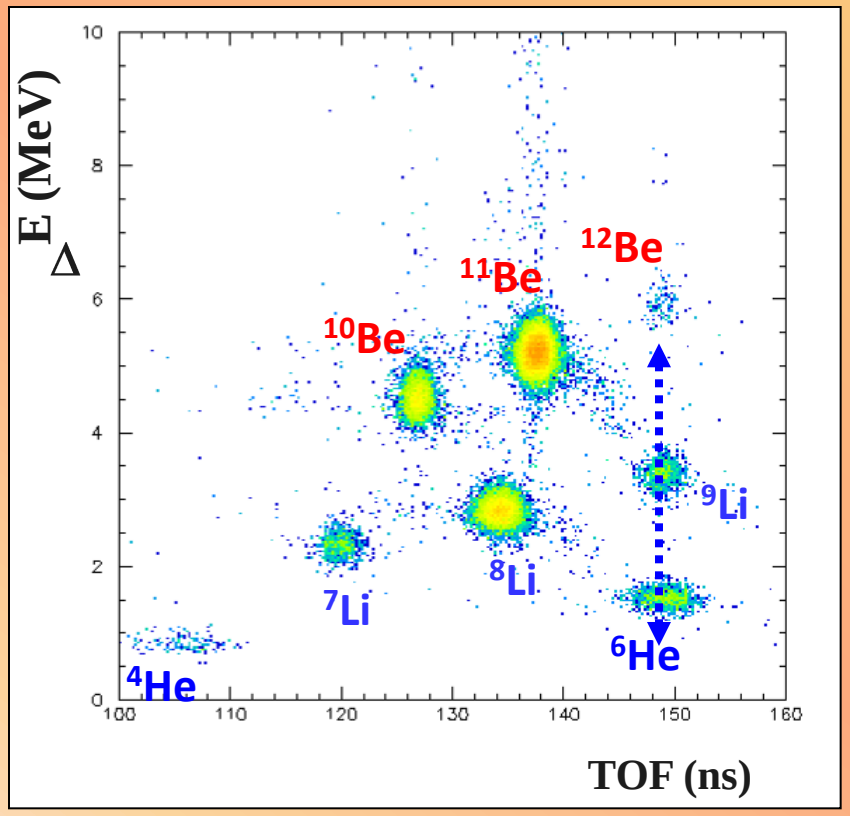


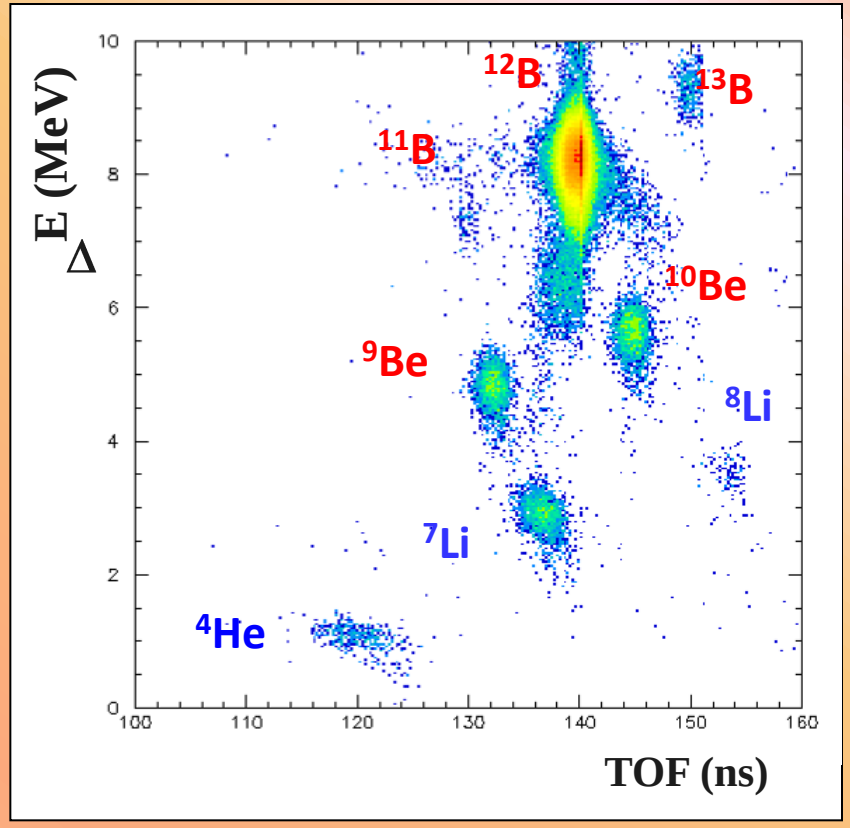




Fragmentation beams on CHIMERA: ^{11}Be - ^{12}B setting

^{13}C primary beam ^{9}Be target (1,5 mm thickness) at 55 MeV/A





^{11}Be 10 kHz

^{12}B 80 kHz

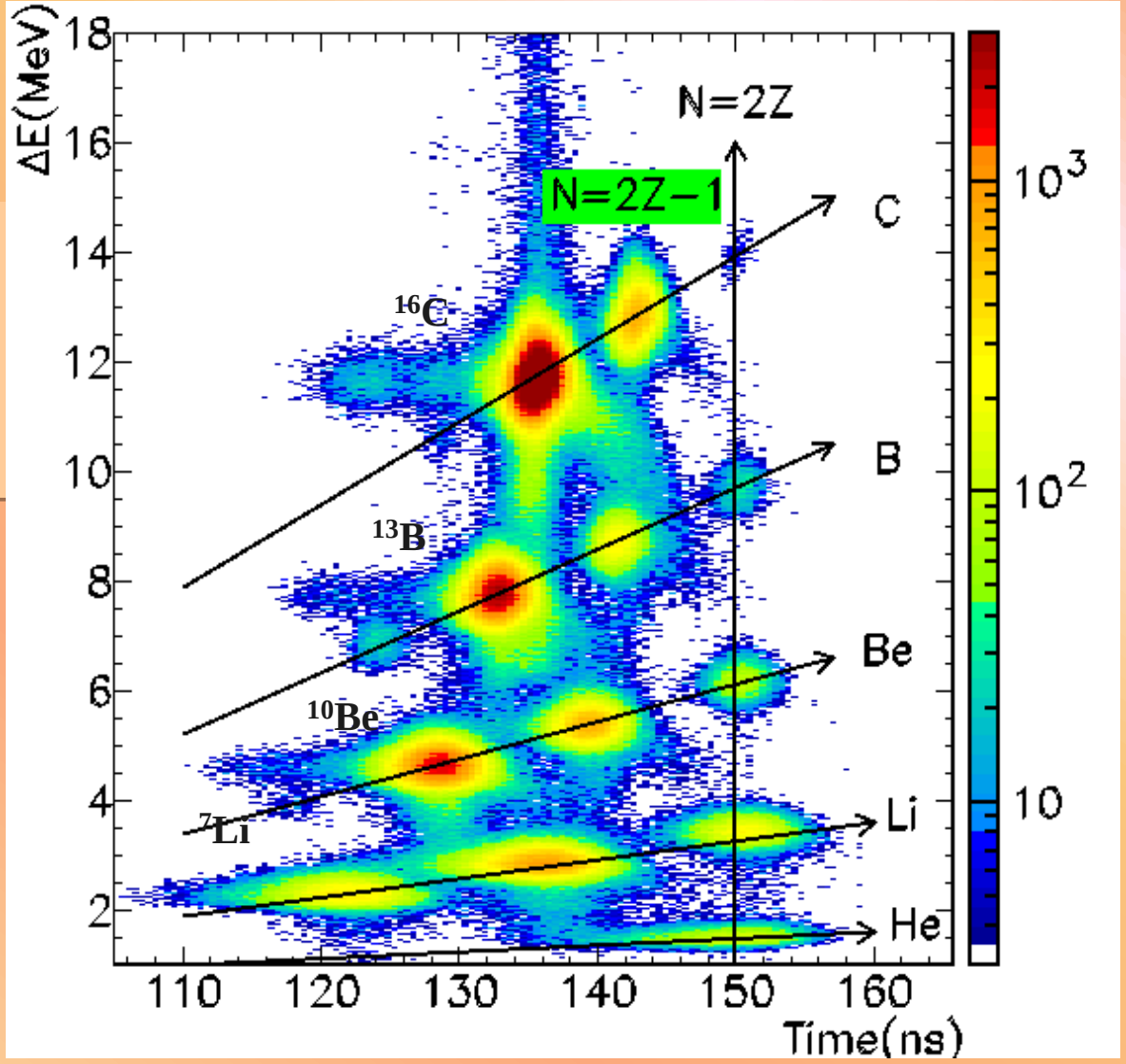
Fragmentation beams on CHIMERA: ^{18}O - ^{16}O primary beams

^{18}O primary beam

magnet setting on ^{11}Be

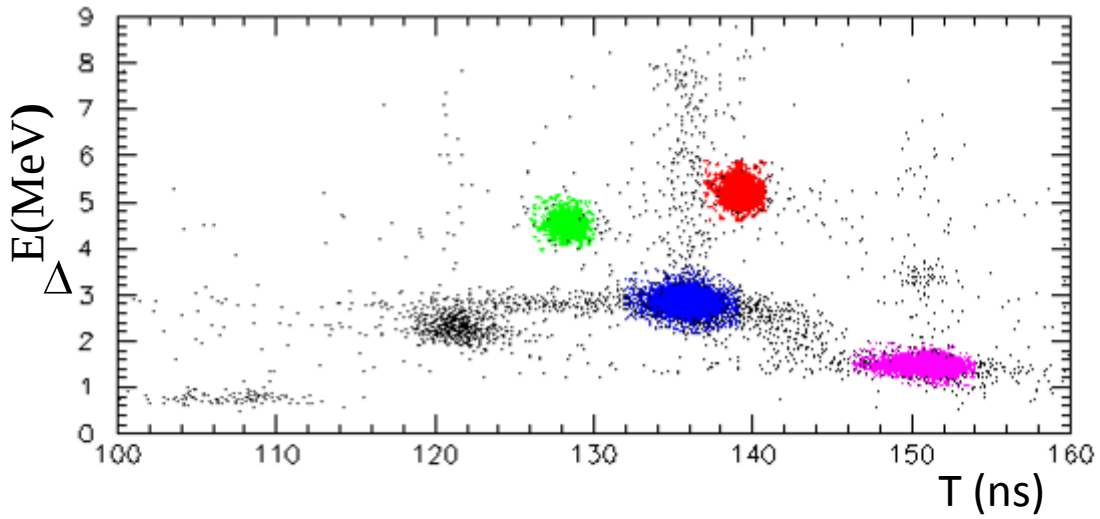
strip 140 μm thick

^{11}Be 3 kHz

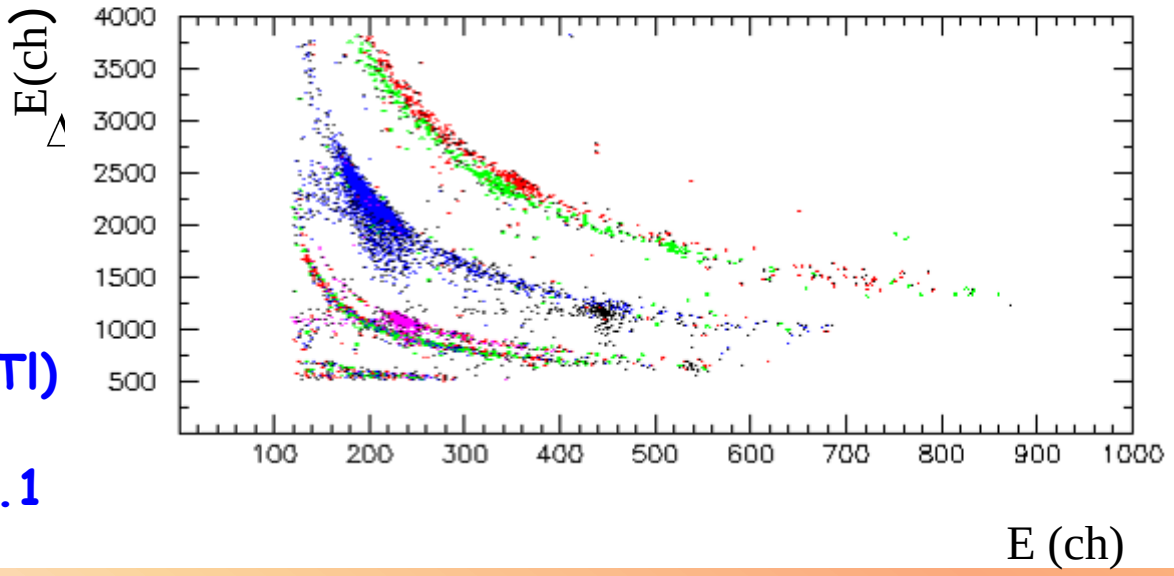


Fragmentation beams on CHIMERA: identification test

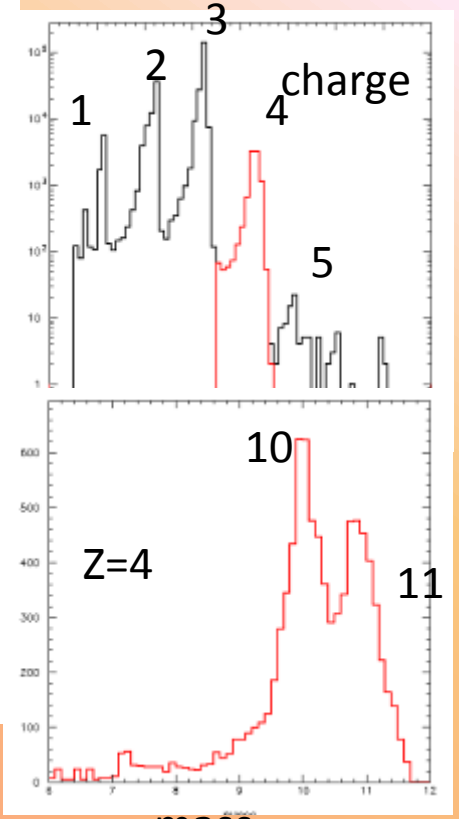
DSSD MCP
ΔE/TOF



Si- CsI(Tl)
ΔE-E
Tel 66 4.1



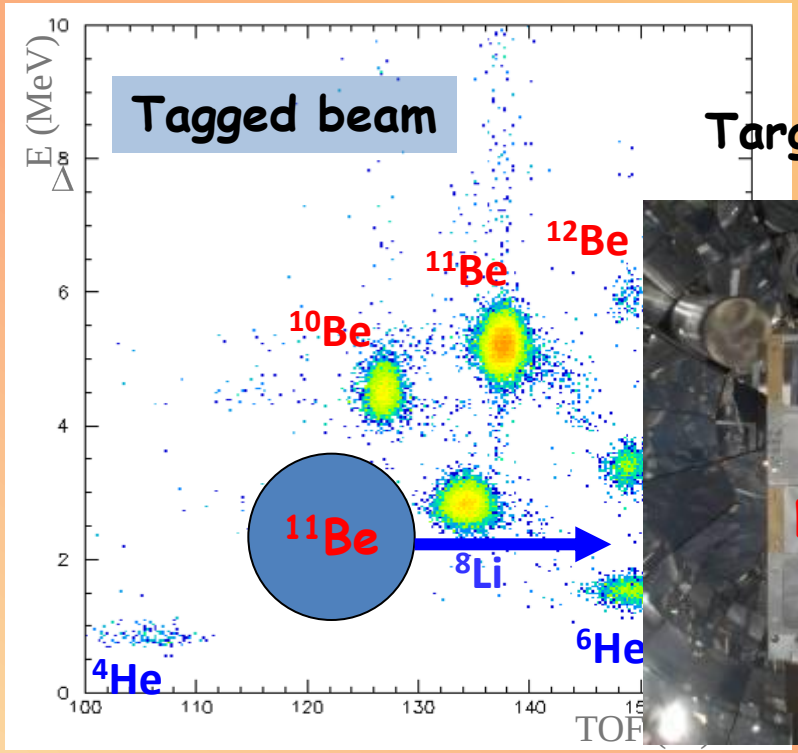
^{11}Be
^{10}Be
^{8}Li
^{6}He



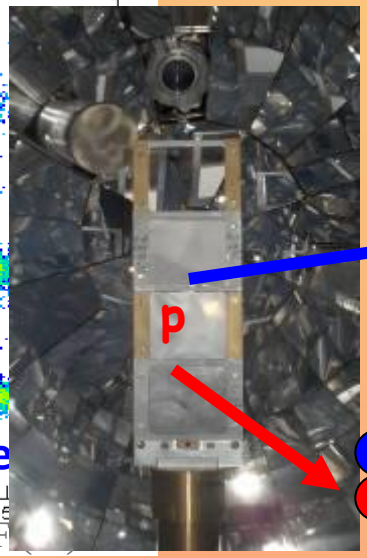
^{13}C primary beam at 55 MeV/A

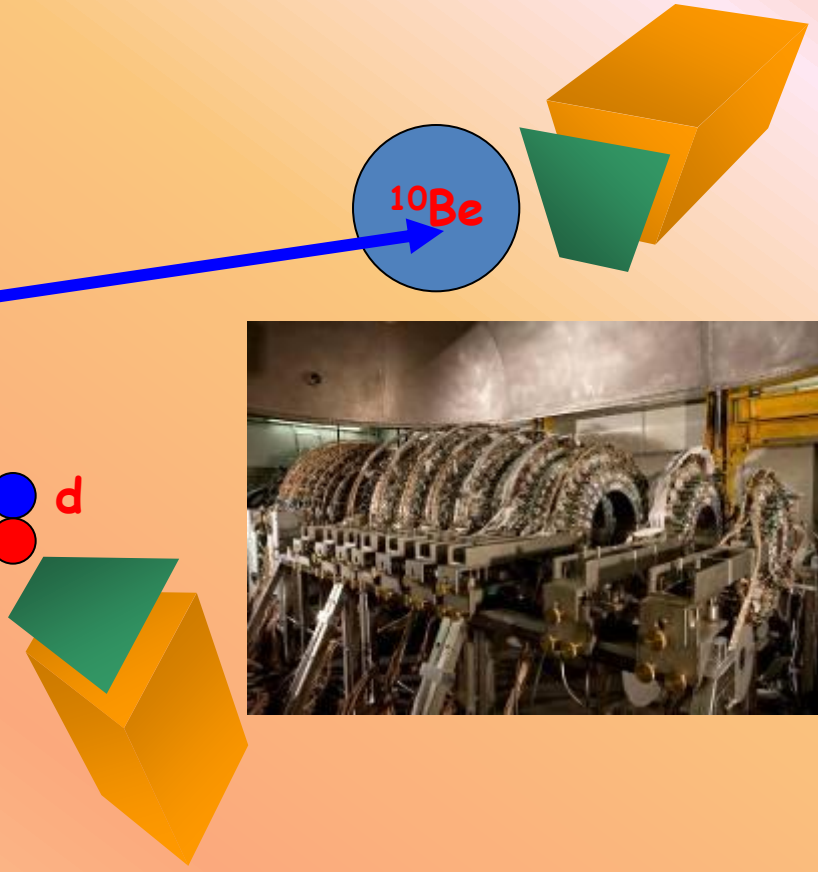
kinematical coincidences technique

transfer reactions study induced on proton and deuteron targets



Target p

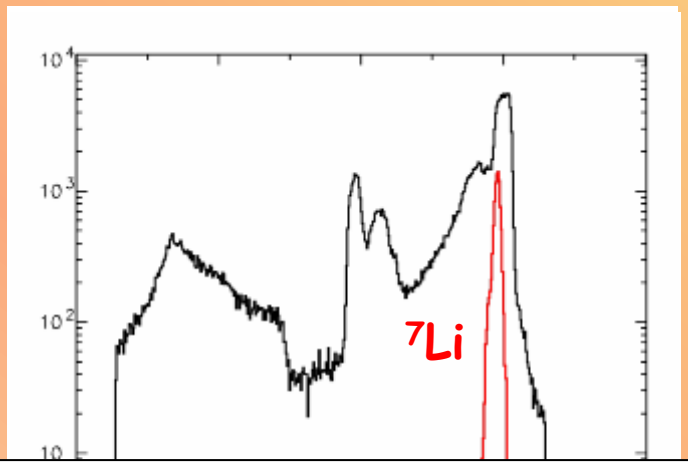




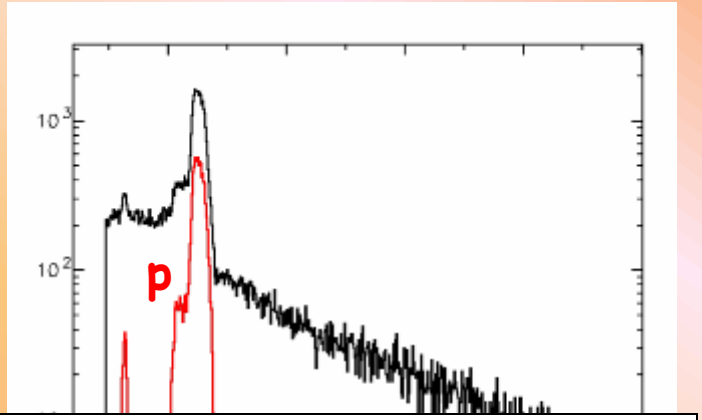
CHIMERA 4π multidetector → kinematical coincidence

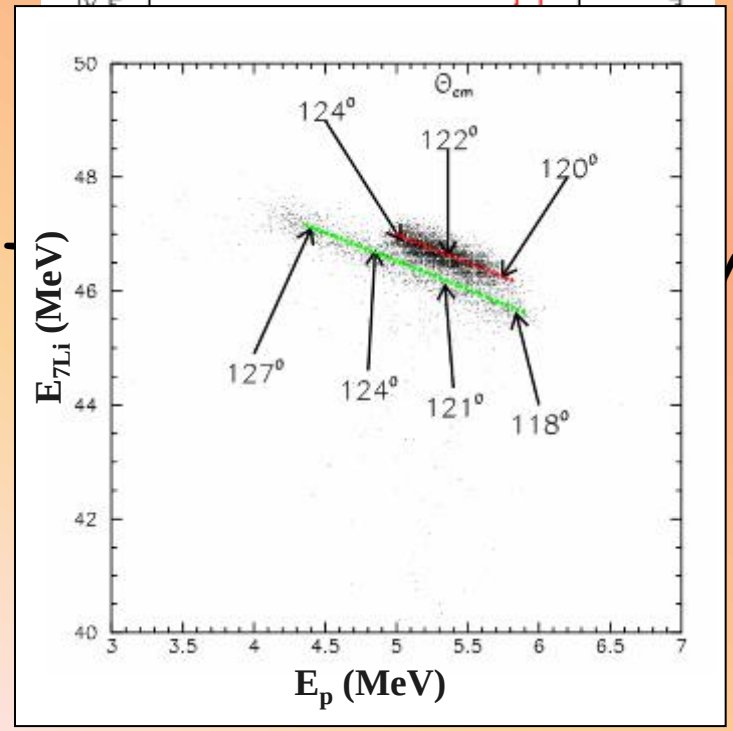
kinematical coincidence technique

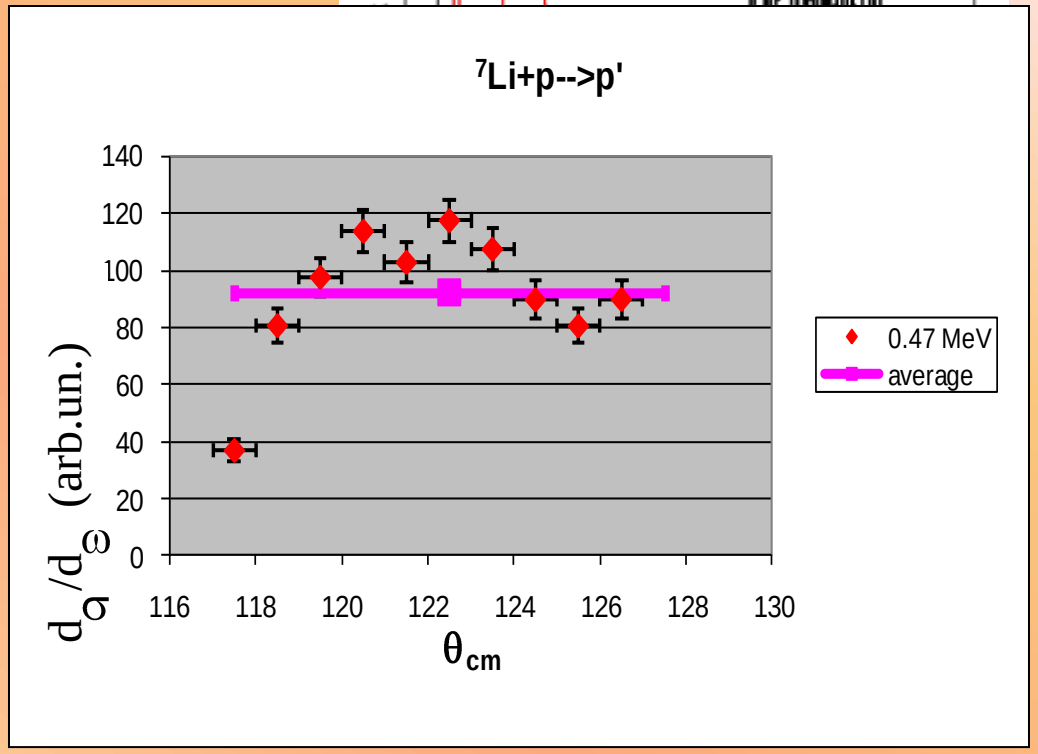
Method capability with the reaction ^{7}Li+p at 52 MeV



$\Delta\phi$=180



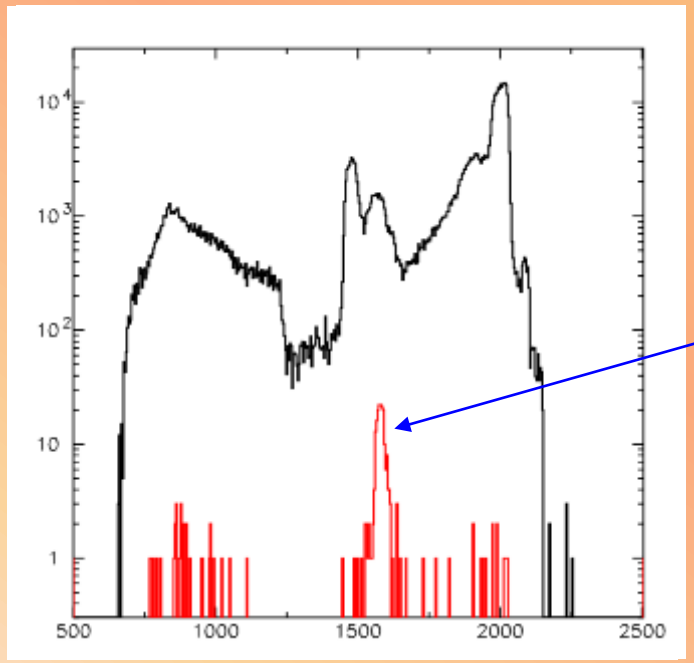




kinematical coincidence technique

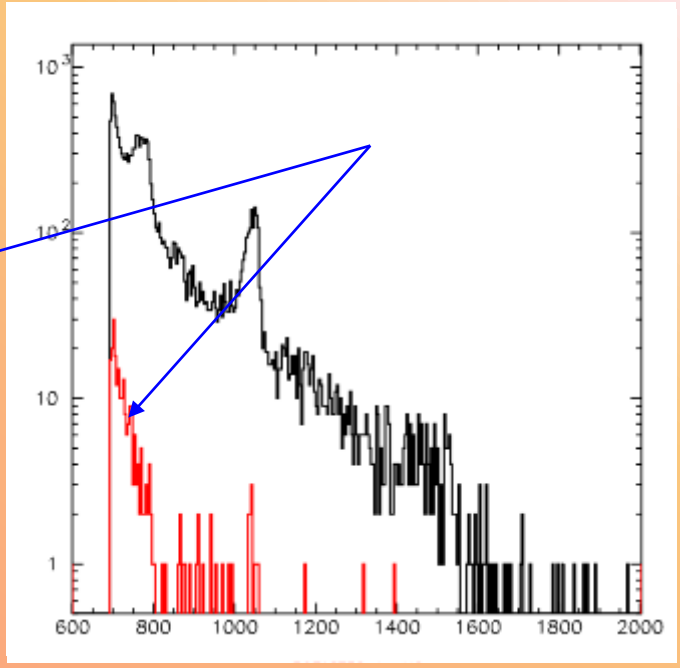
It is very interesting to see the reaction p(^{7}Li,^{7}Be)n

CHIMERA detects charge particles
neutrons make some reactions inside CsI producing γ, p, α



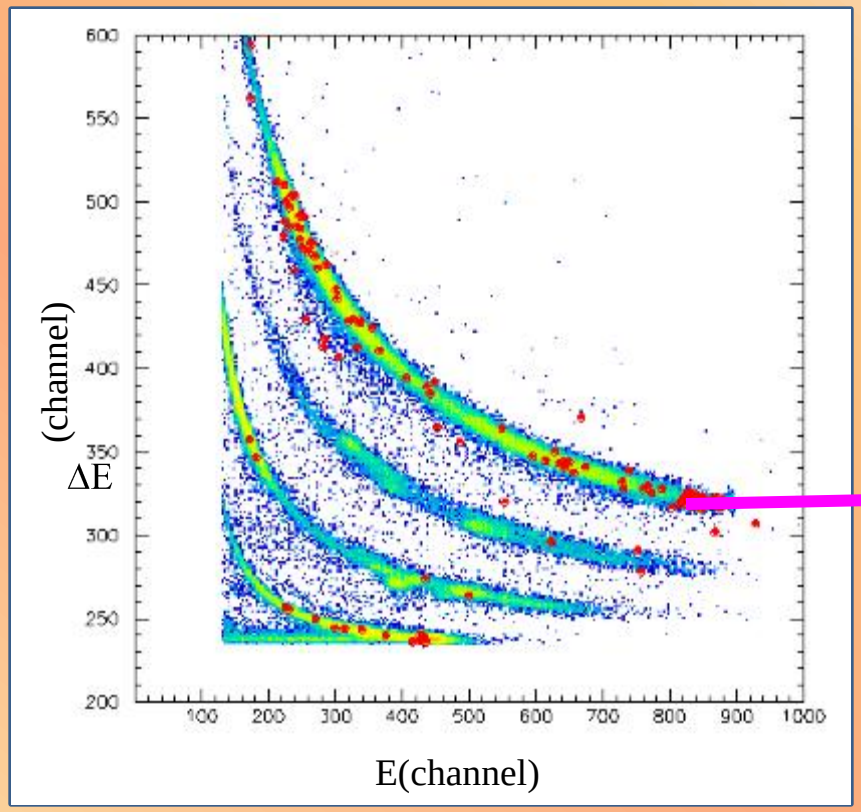
Tel 117 (θ=6.4) silicon energy

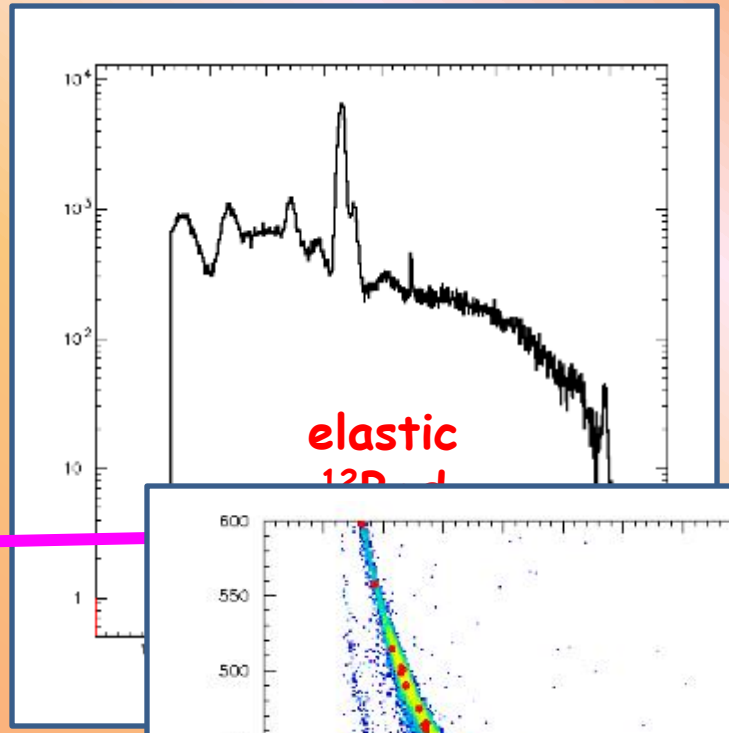
Δϕ=180°

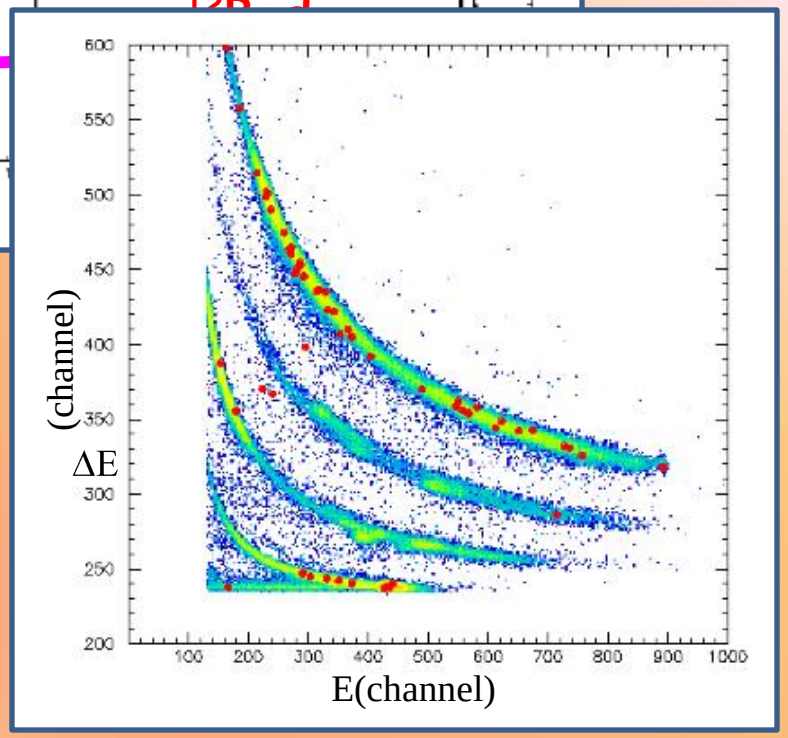


Tel 624 (θ=25.5) CsI(Tl) energy

Kinematical coincidences – preliminary results





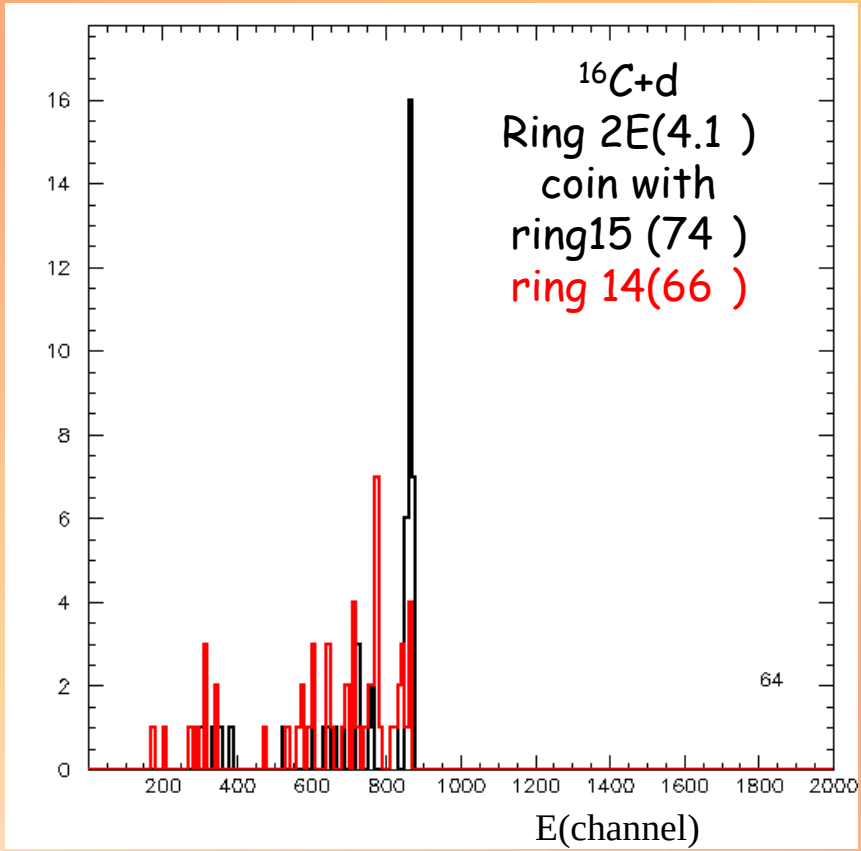


Tel 38(3.1)
Target CD beam setting on ^{12}B

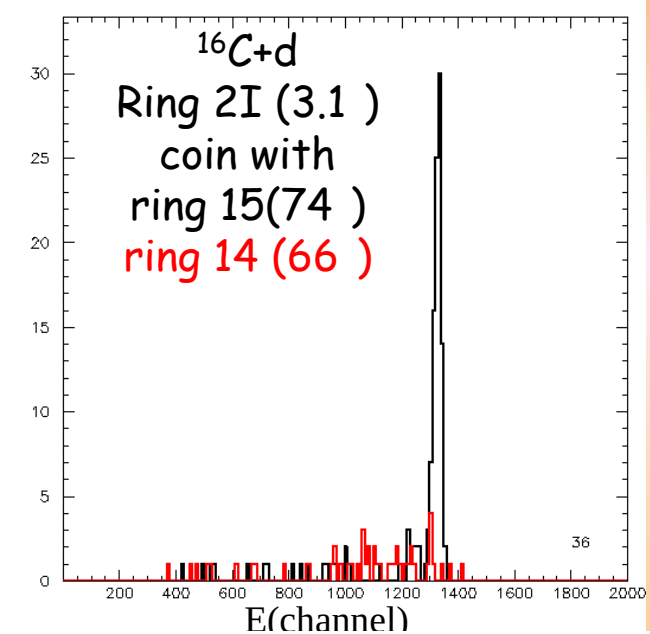
Coincidences between telescopes
with $\Delta\phi$=180
Tel 38(3.1) - 870(66)

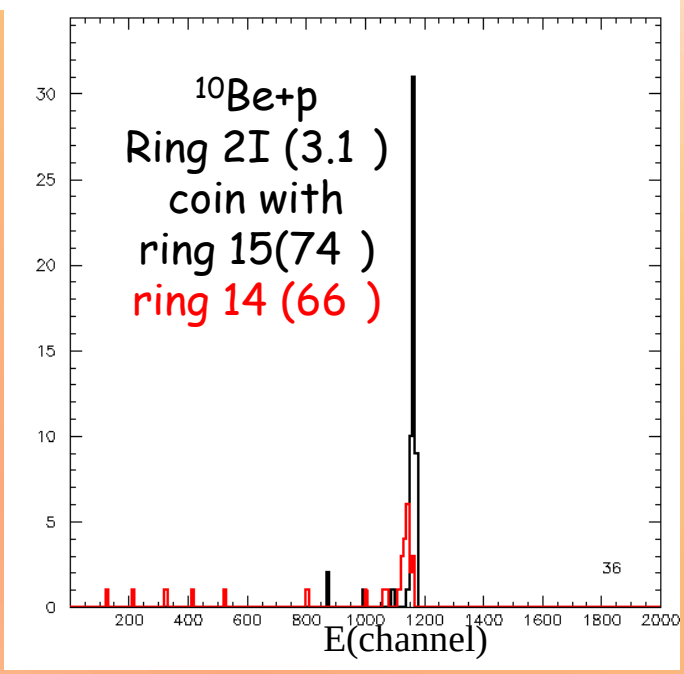
Tel 38(3.1)-875(66)
$\Delta\phi$=215

Kinematical coincidences – preliminary results



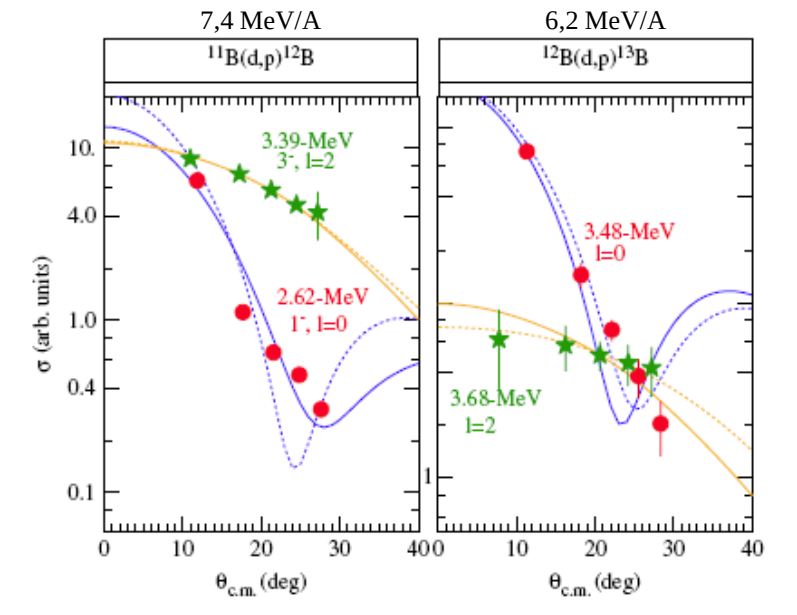
^{16}C excite state 1.7 MeV





Transfer reactions

B. B. Back et al.,
PHYSICAL REVIEW LETTERS 104, 132501 (2010)



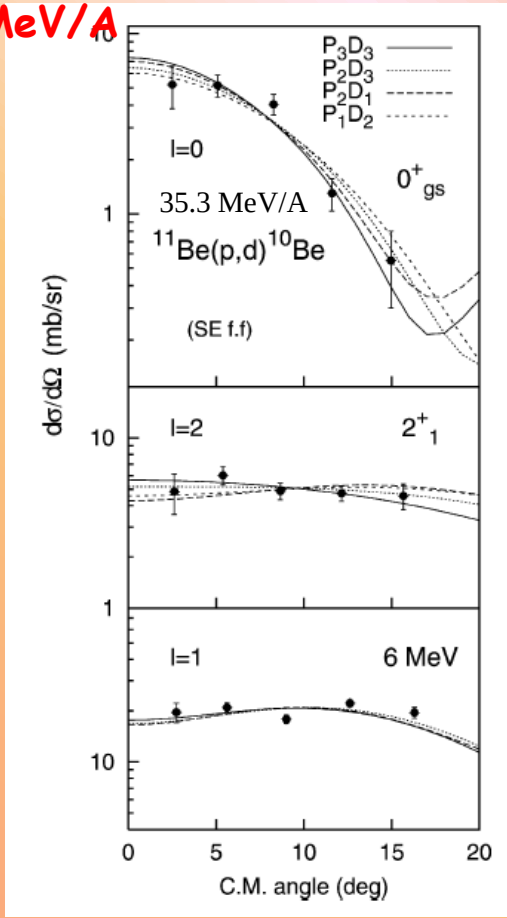
Transfer reactions

p(^{11}Be, ^{10}Be)d at 48 MeV/A

d(^{10}Be, ^{11}Be)p at 58 MeV/A

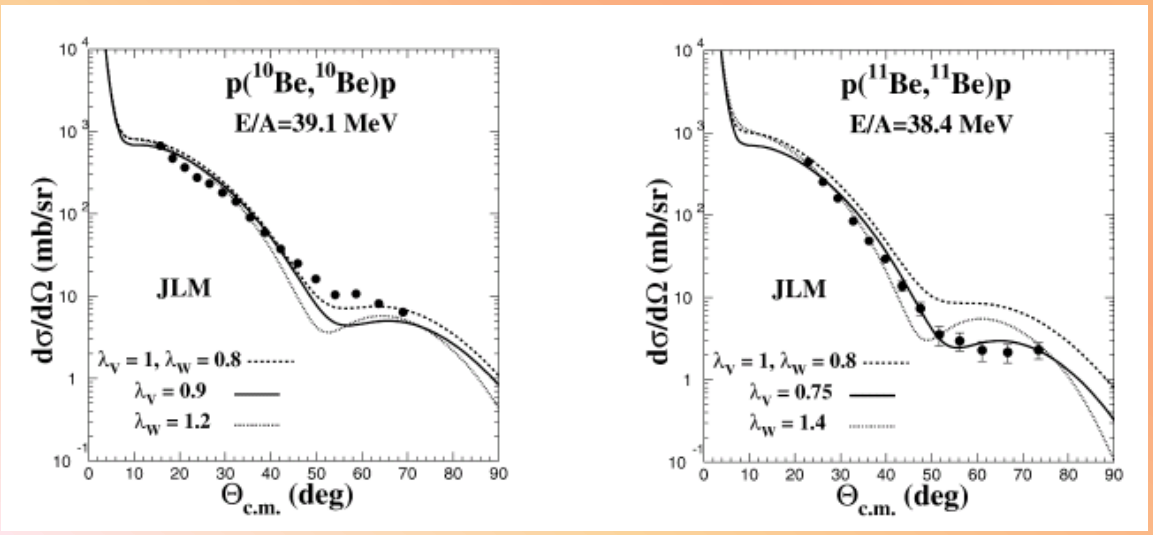
d(^{12}B, ^{11}Be) ^{3}He at 47 MeV/A

p(^{13}B, ^{11}Be) ^{4}He at 52.4 MeV/A



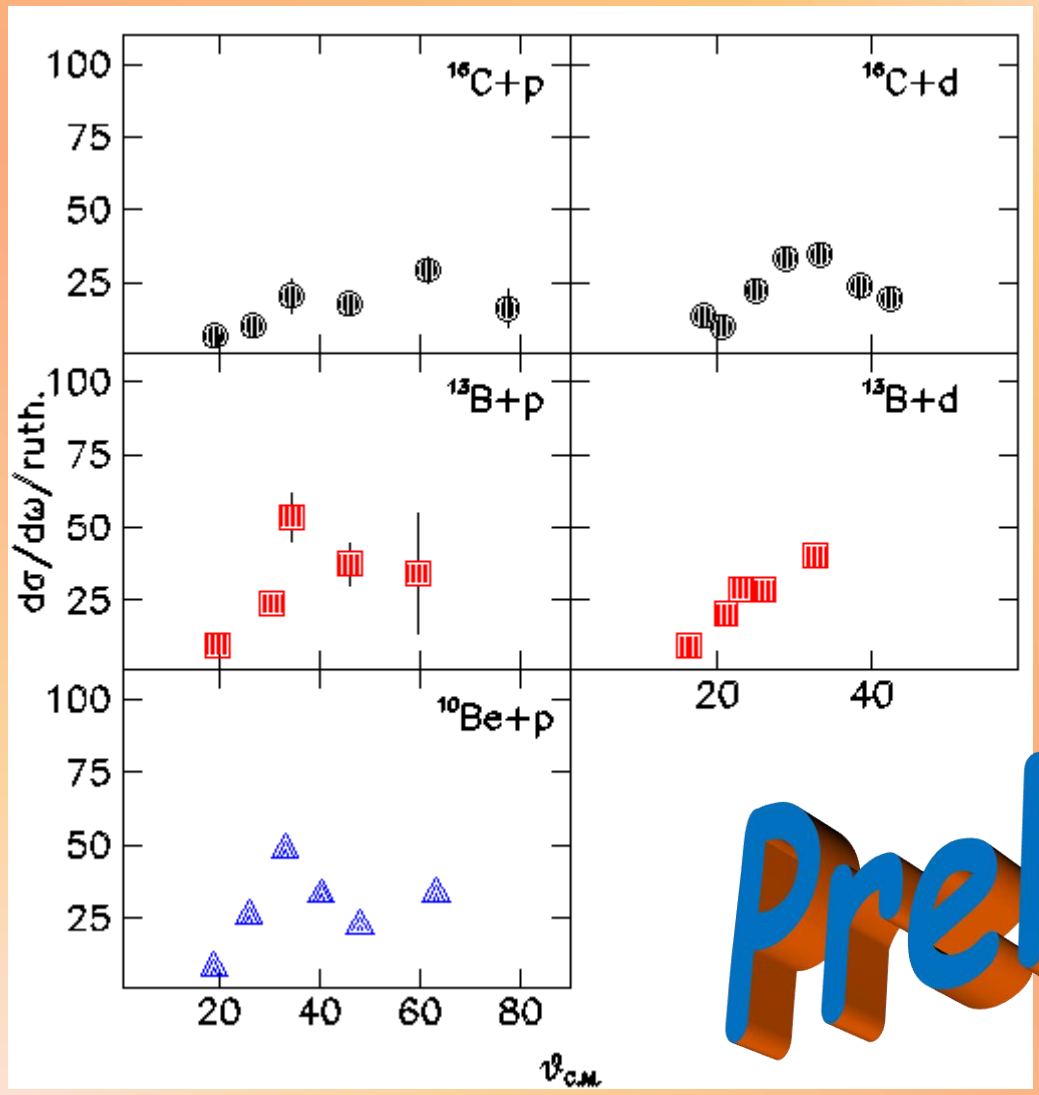
J.S. Winfield et al.
Nuclear Physics A 683 (2001) 48–78

V. Lapoux et al, PHYSIC LETTERS B 658 (2008) 198-202



Angular distribution

Elastic scattering (~ 50 MeV/A)



Preliminary

CONCLUSION

- Trough kinematical coincidence we're going to study transfer reactions with light exotic beams
- On June 2010 we'll have also beam ^{9}Li on 5.5 MeV/A by LNS-EXCYT facilities
- Next improvement to detect particles at 0
- New experiments by using fragmentation beams at LNS (primary beam ^{36}Ar to produce $^{32,33}Ar$ neutron poor beams)
- Exotic beams delivered by SPES at LNL.

EXOCHIM collaboration

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