

Gli esperimenti ISO-FAZIA e FAZIA-SYM ai LNS

Diego Gruyer

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(for the FAZIA collaboration)

The FAZIA Project



- What is the EOS of asymmetric nuclear matter ?
- How does nuclear matter clusterize at low density ?
- How do clusters behave in low density nuclear medium ?



- Heavy-ion collisions around Fermi energy
- FAZIA : a large-scale isospin-sensitive detector



- The FAZIA campaign at LNS

Basic element of FAZIA : the block



Complex inside, simple outside

Power supply and block card

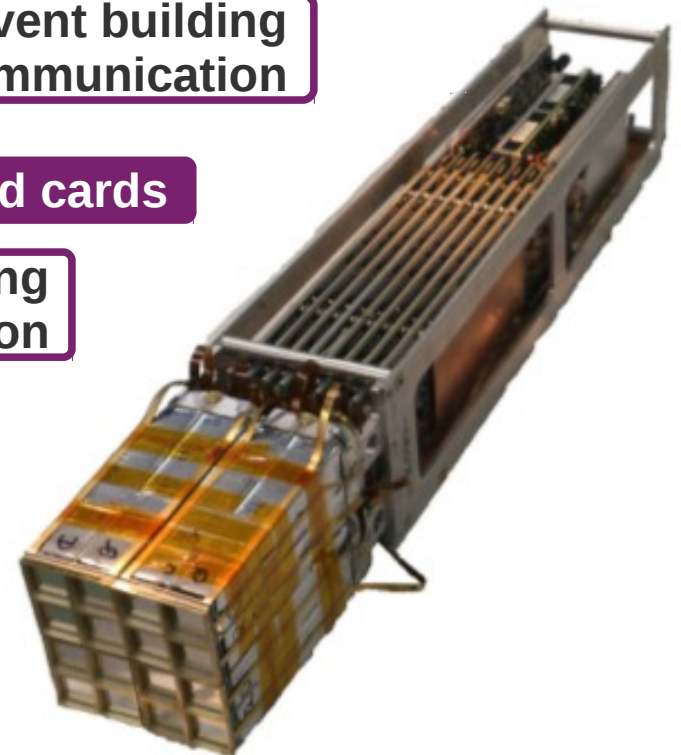
Event building
Communication

8 front end cards

Signal sampling and shaping
Leackage current compensation

16 telescopes

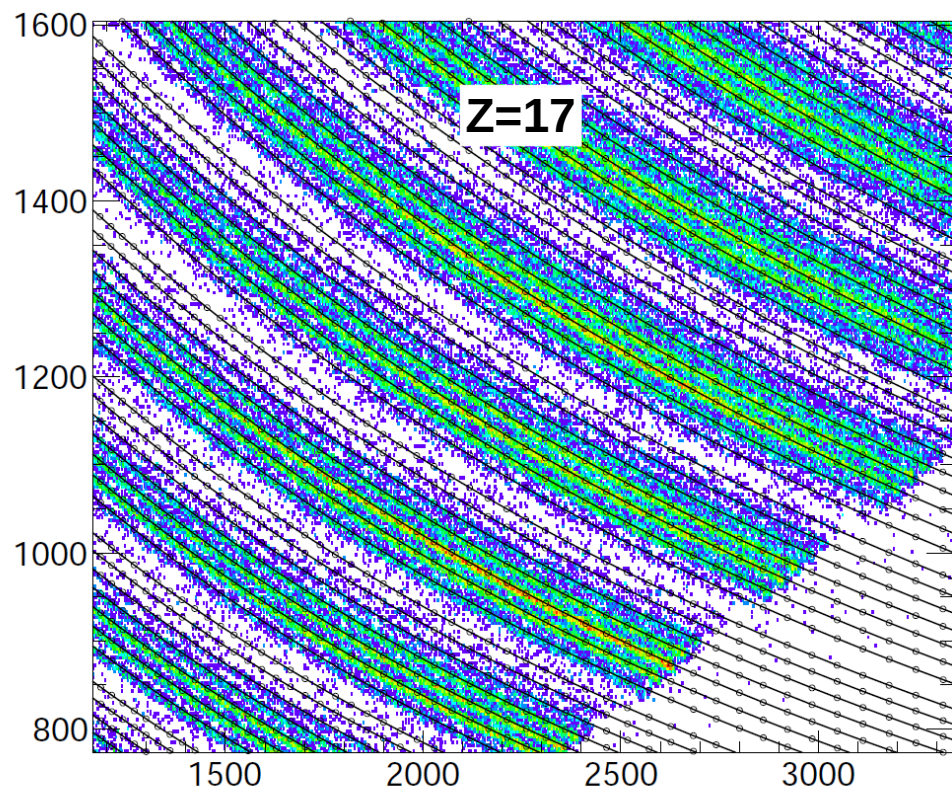
Si(300 μ m)-Si(500 μ m)-CsI(Tl)
 Δ E-E and PSA identifications



Basic element of FAZIA : the block



Complex inside, simple outside



A=35

A=34

A=33

Power supply and block card

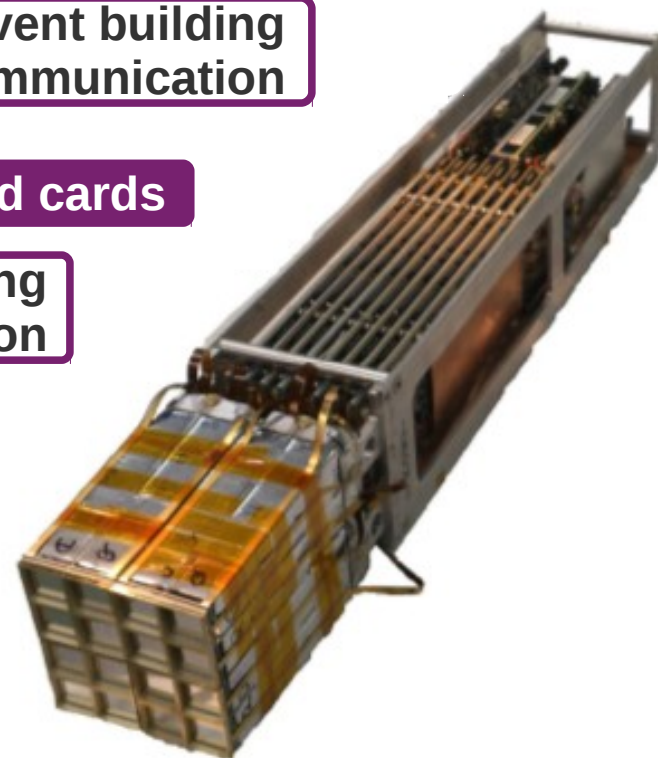
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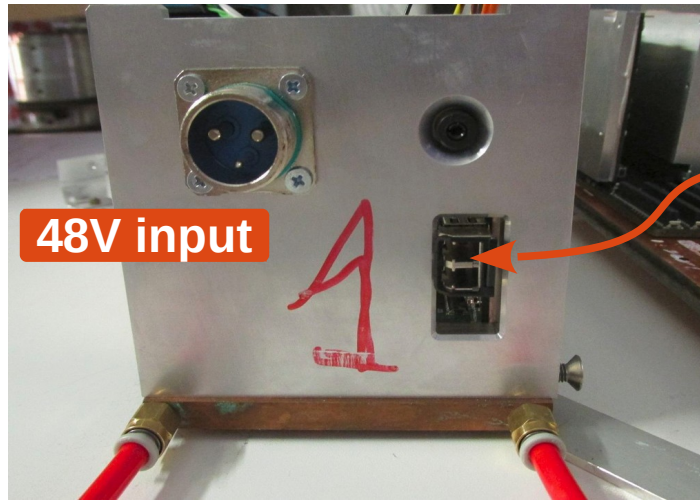
Si(300 μ m)-Si(500 μ m)-CsI(Tl)
 ΔE -E and PSA identifications



Basic element of FAZIA : the block



Complex inside, simple outside



48V input

Optical fiber

Slow control

Acquisition

Power supply and block card

Event building
Communication

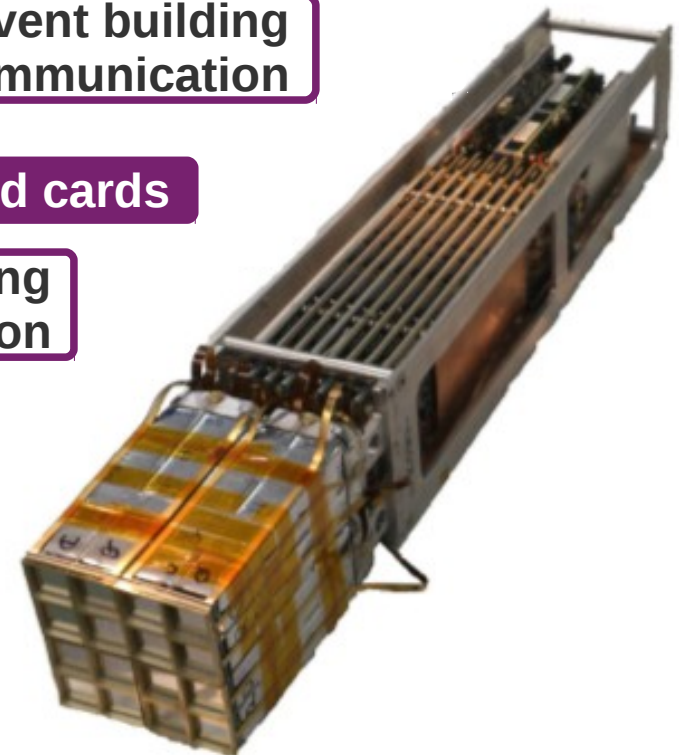
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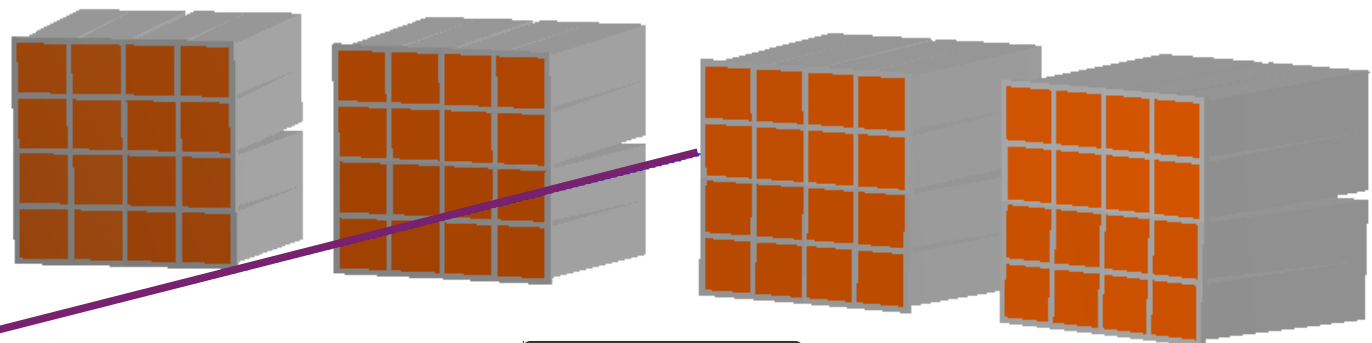
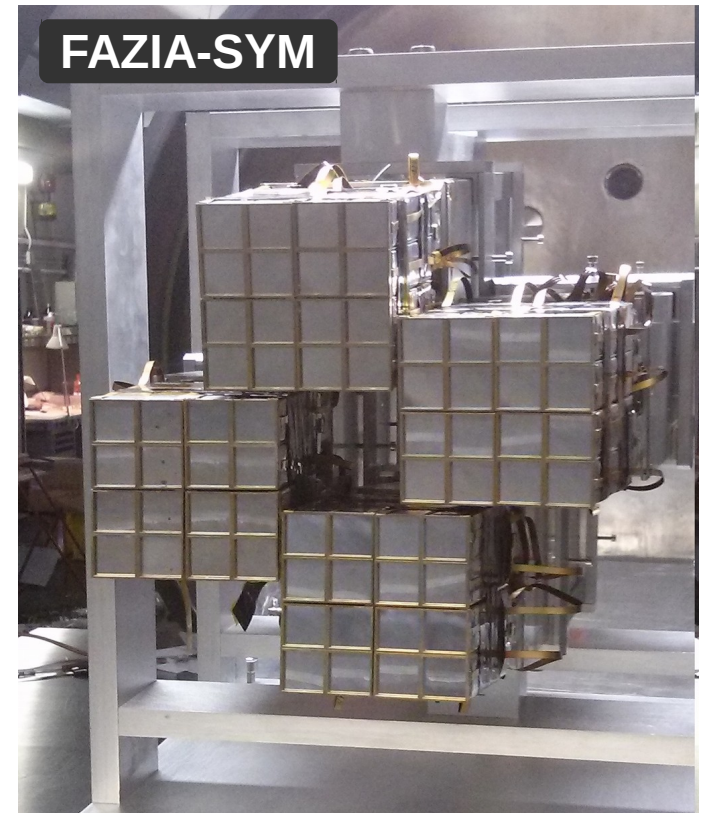
Si(300 μ m)-Si(500 μ m)-CsI(Tl)
 Δ E-E and PSA identifications

Cooling
system



Modular geometry

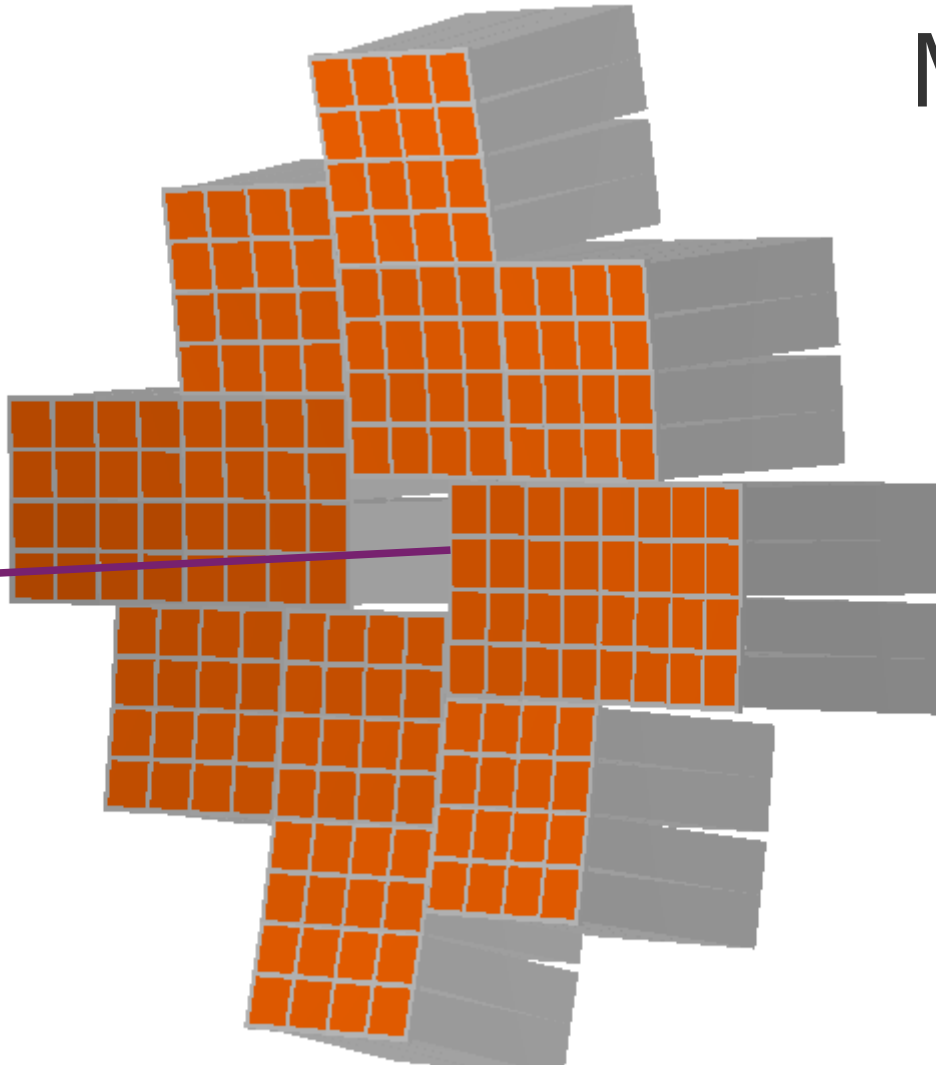
It's time to play with your blocks



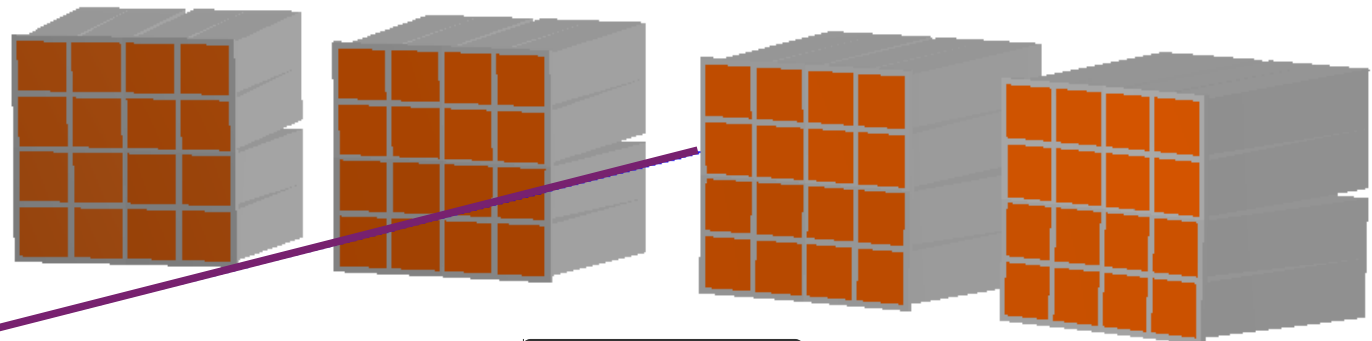
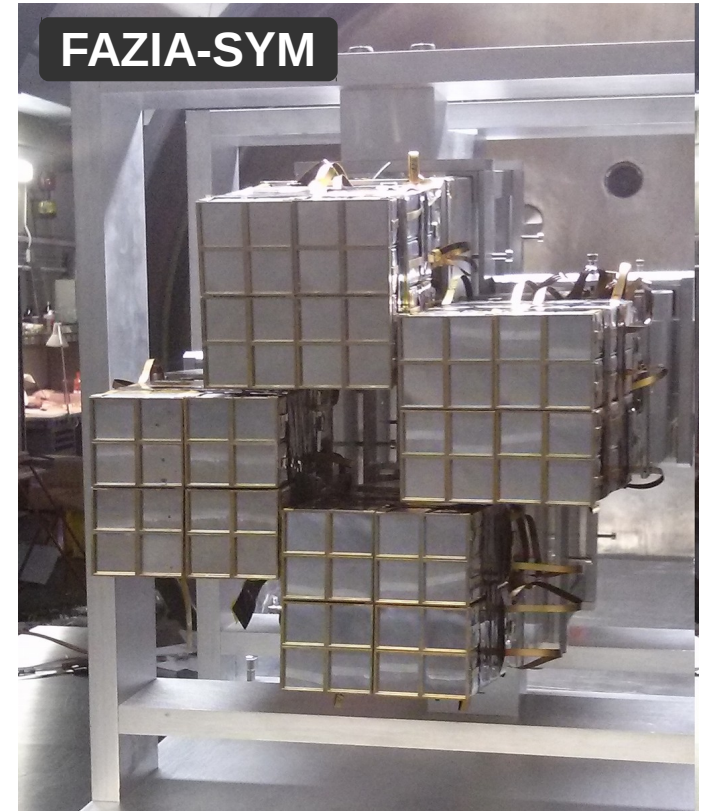
ISO-FAZIA

Modular geometry

It's time to play with your blocks



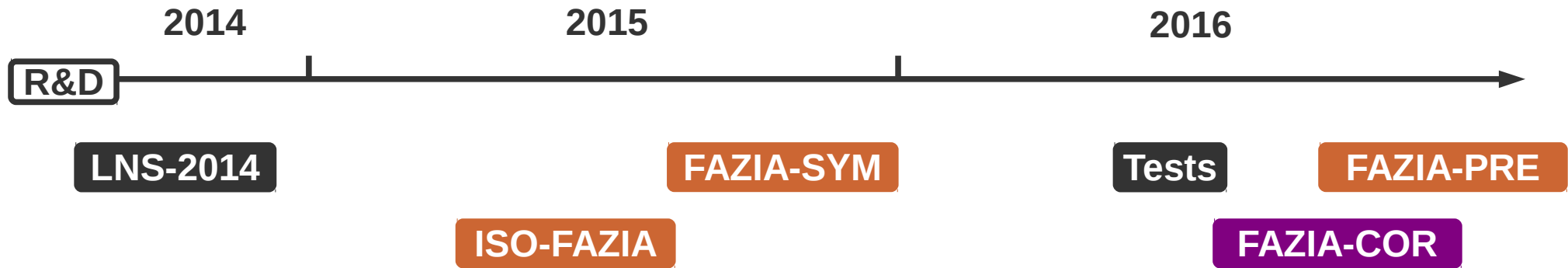
FAZIA demonstrator



ISO-FAZIA

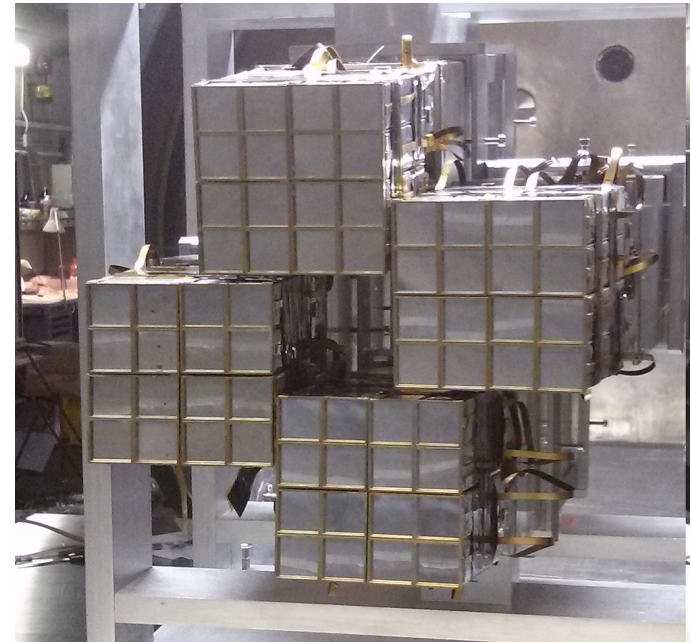
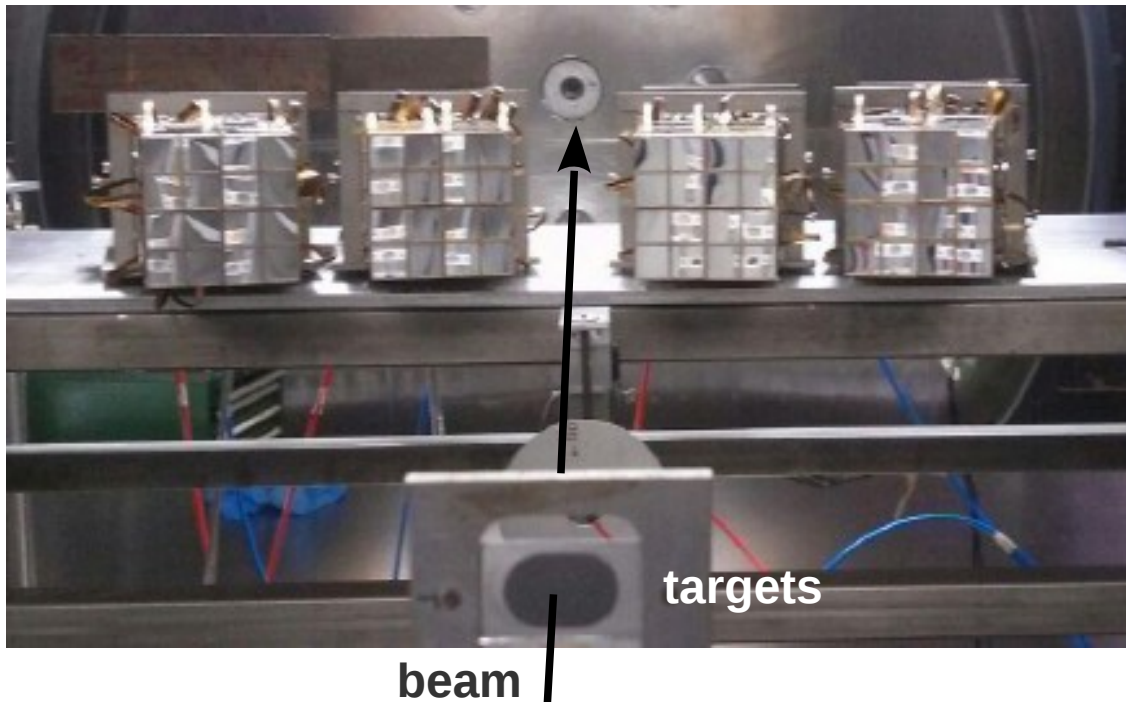
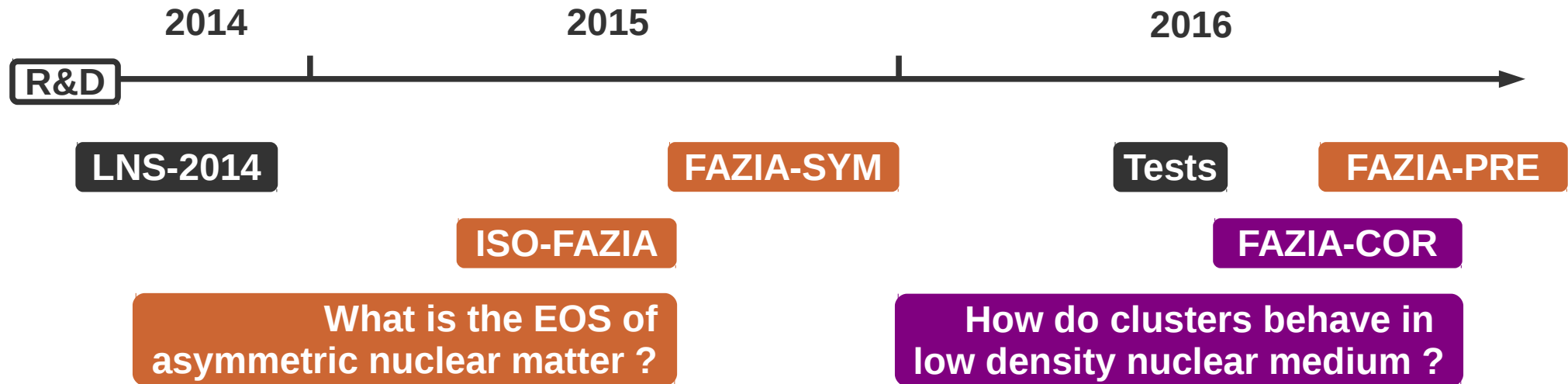
Experimental campaign

LNS Catania

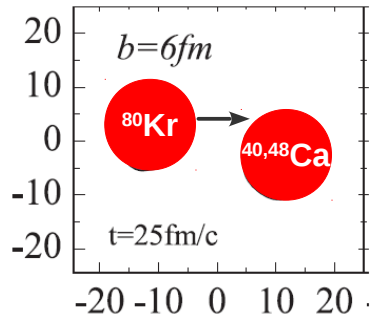


Experimental campaign

LNS Catania

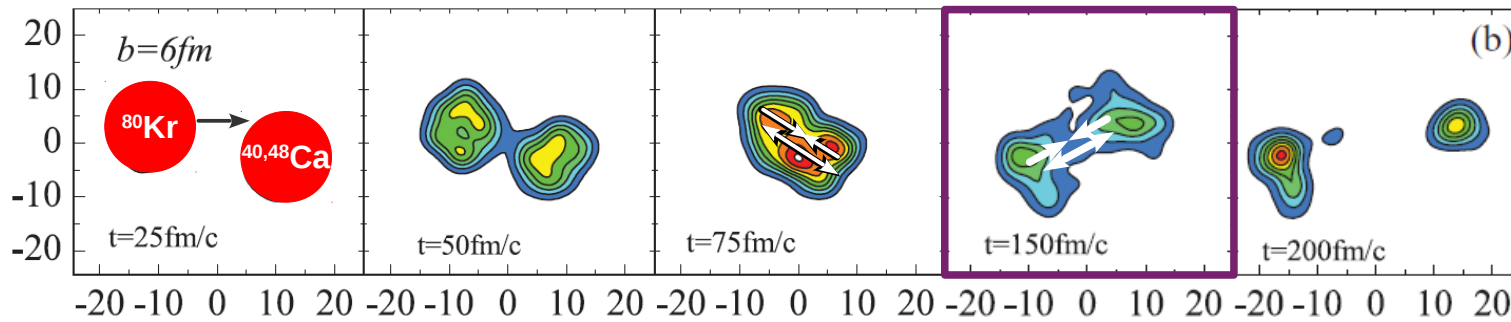


ISO-FAZIA : Isospin transport



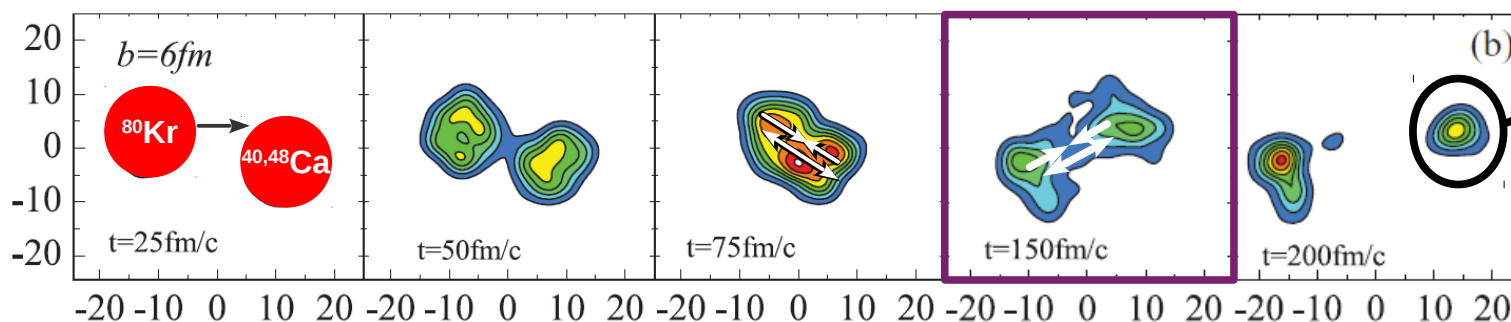
$^{80}\text{Kr} + ^{40,48}\text{Ca} @ 35\text{MeV}/A$

ISO-FAZIA : Isospin transport

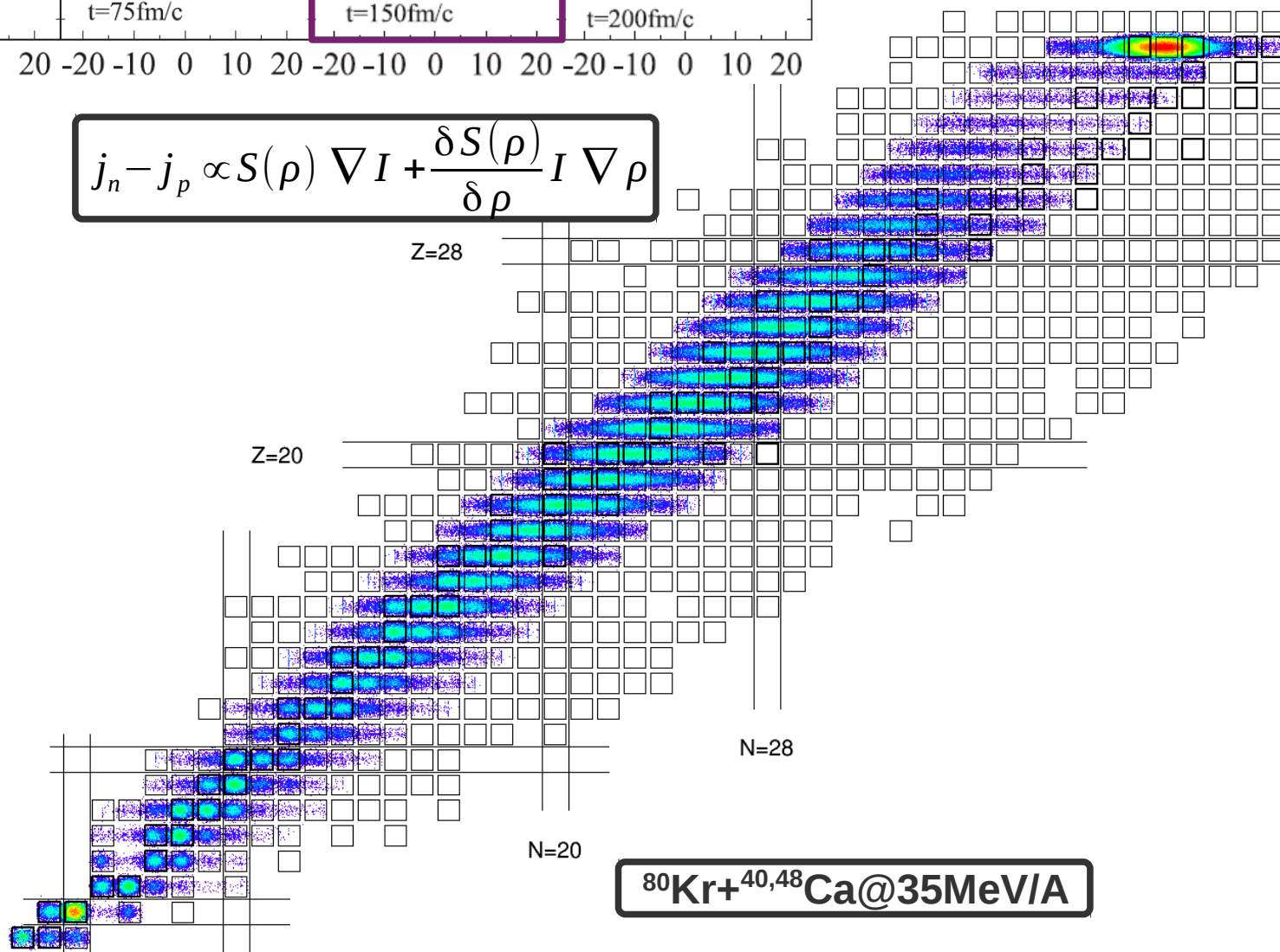


$$j_n - j_p \propto S(\rho) \nabla I + \frac{\delta S(\rho)}{\delta \rho} I \nabla \rho$$

ISO-FAZIA : Isospin transport

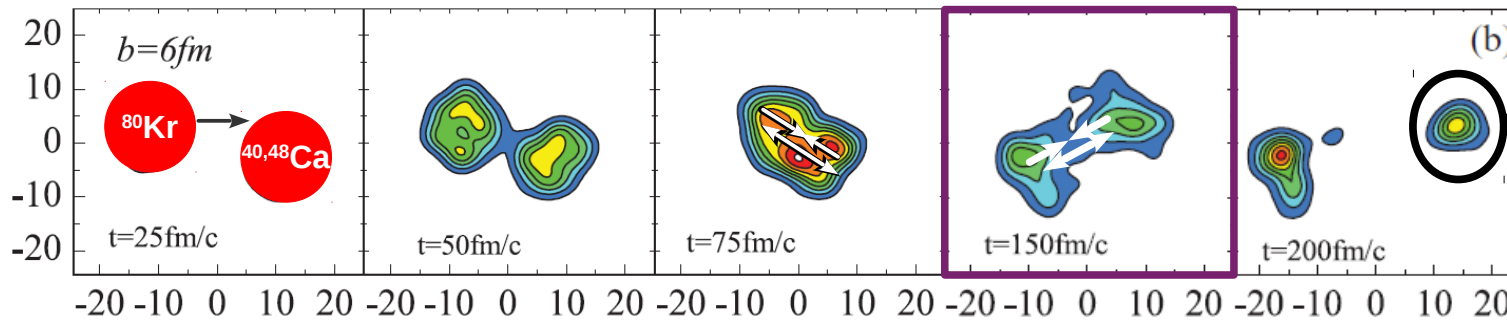


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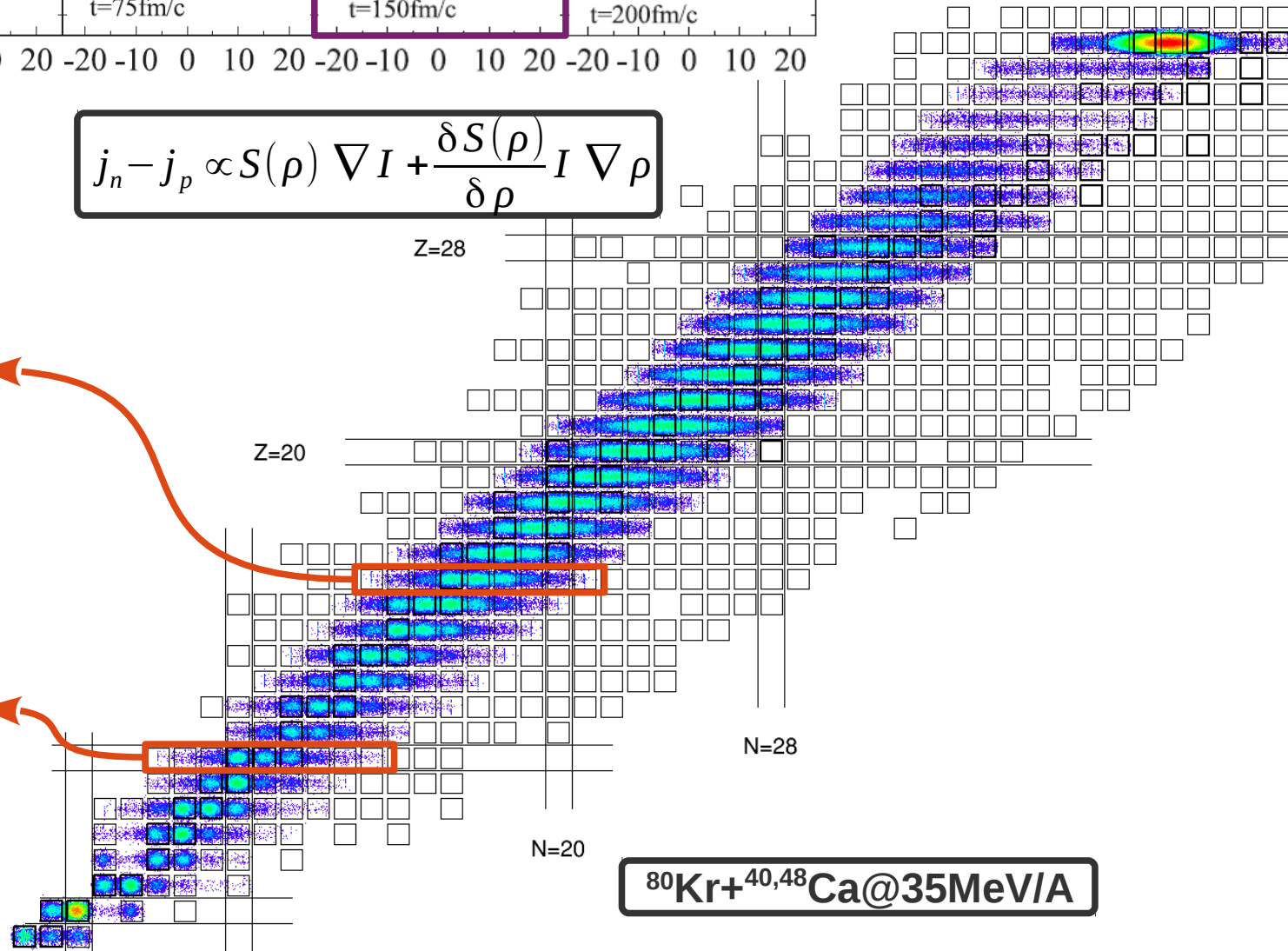
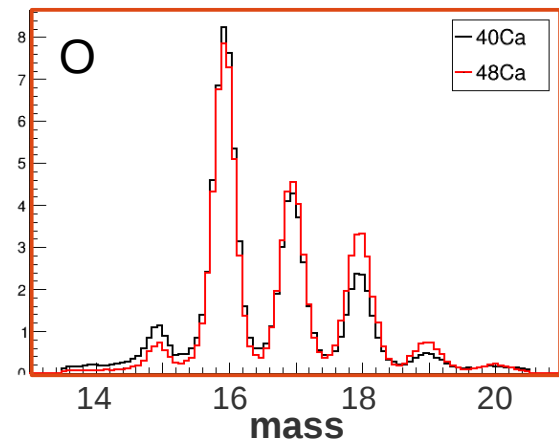
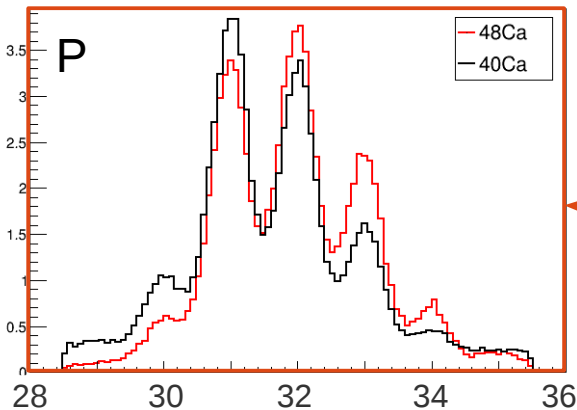


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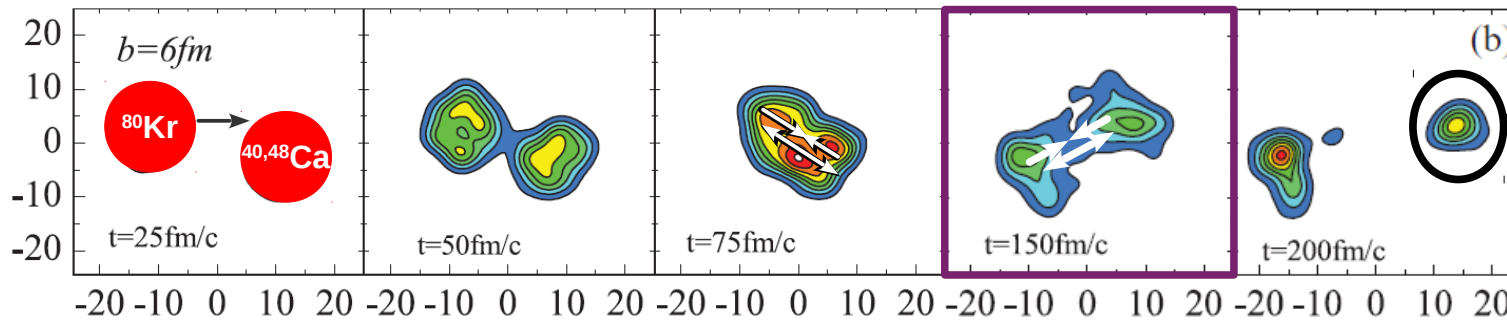
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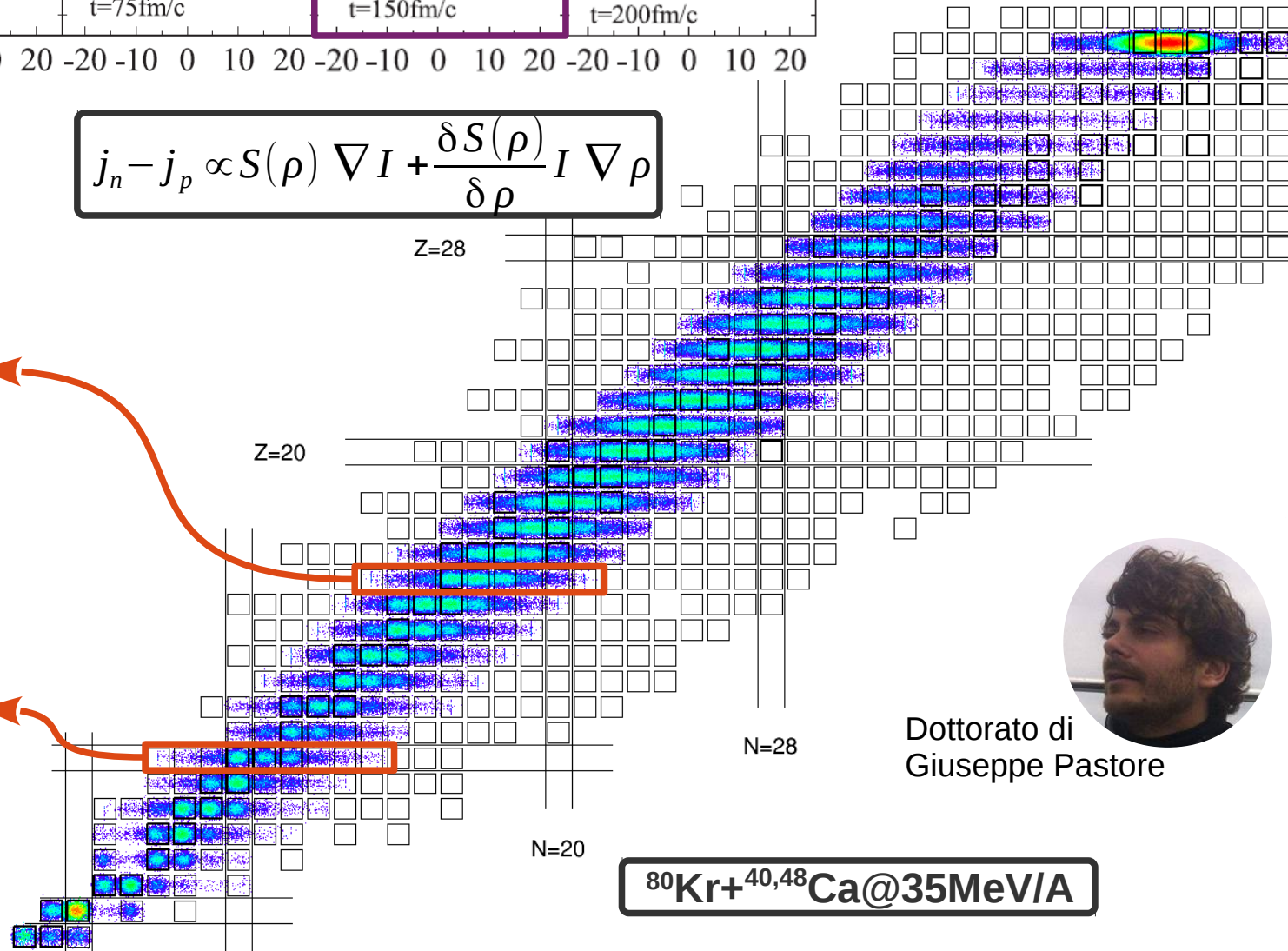
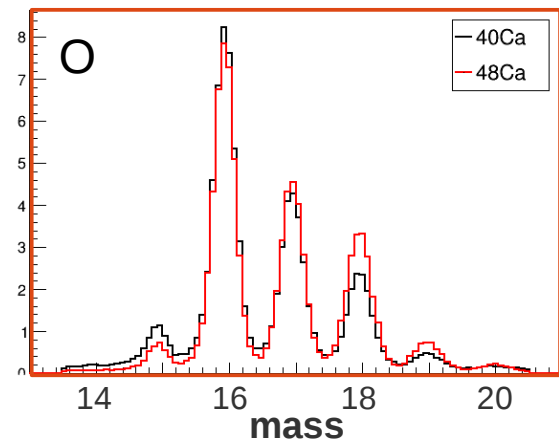
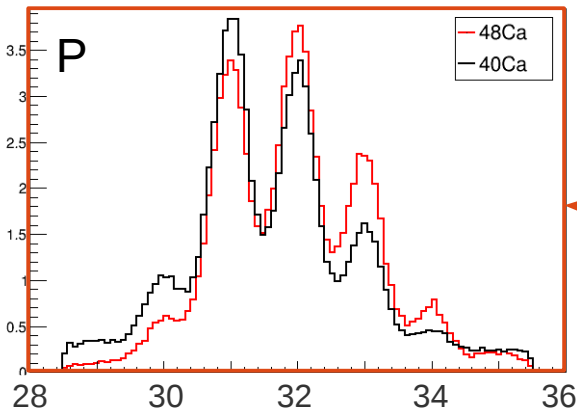
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ISO-FAZIA : Isospin transport



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Dottorato di
Giuseppe Pastore

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The FAZIA project



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- How does nuclear matter clusterize at low density ?
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- Full charge identification and isotopic resolution up to $Z \sim 25$
- Modular geometry (belt, wall...)
- 4 FAZIA blocks already working at Catania



- ISO-FAZIA and FAZIA-SYM successfully ran in 2015
- FAZIA-COR and FAZIA-PRE planned in 2016(2017)

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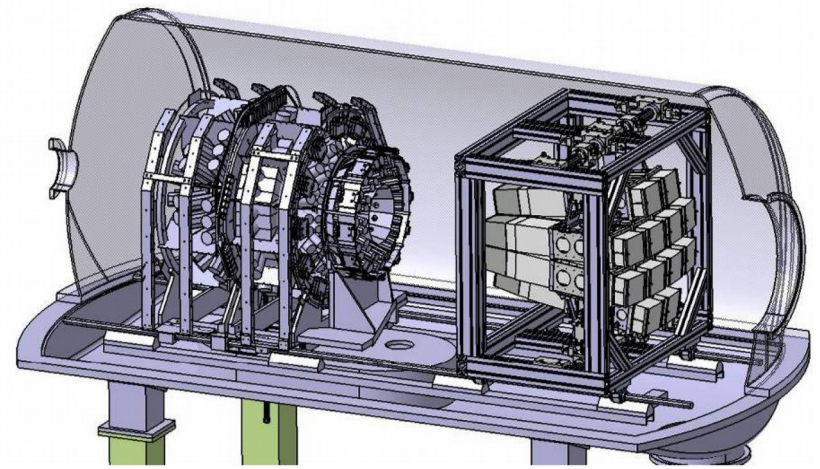
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- Coupling FAZIA demonstrator with INDRA at GANIL (Francia)



Collaborators

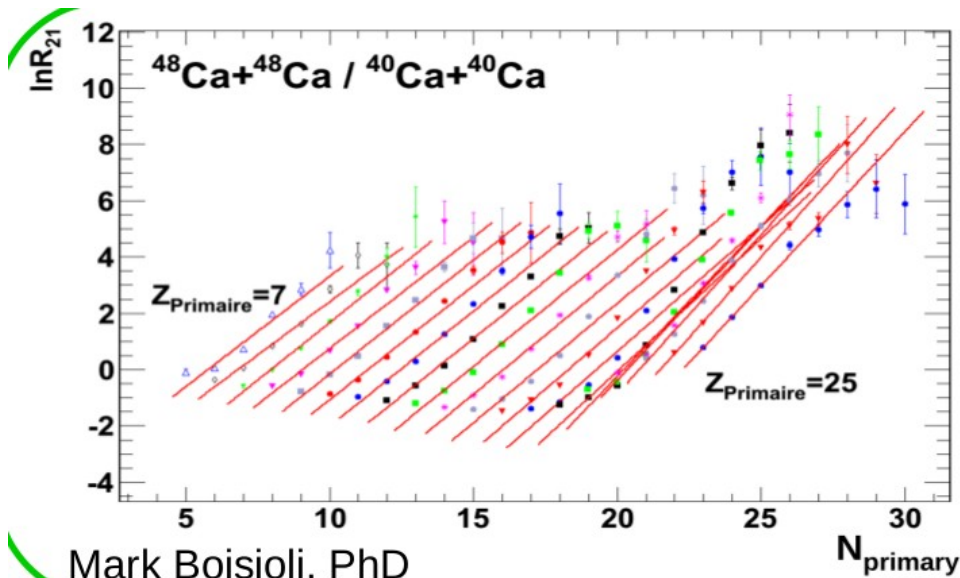
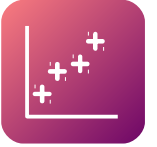
D.Gruyer¹, B.Borderie²,
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N.LeNeindre⁷, O.Lopez⁷,
M.Parlog⁷, E.Vient⁷,
M.Cinausero⁸, F.Gramegna⁸,
J.Mabiala⁸, T.Marchi⁸,
M.Degerlier^{2,9}, J.Duenas¹⁰,
D.Fabris¹¹, A.Kordyasz¹²,
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A.Ordine¹⁴, G.Spadaccini¹⁴,
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F.Aksouh¹⁵, K.Kezzar¹⁵,
L.Quattrocchi¹⁷



Institutions

- ¹INFN - Firenze, Italy
- ²IPN Orsay and Univ. Paris-Sud, France
- ³Univ. of Firenze, Italy
- ⁴INFN LNS - Catania, Italy
- ⁵Univ. and INFN - Bologna, Italy
- ⁶GANIL, France
- ⁷LPC Caen, France
- ⁸INFN LNL - Legnaro, Italy
- ⁹Nevsehir Univ. Physics Department, Turkey
- ¹⁰Univ. of Huelva, Spain
- ¹¹INFN - Padova, Italy
- ¹²Univ. of Warsaw, Poland
- ¹³Jagellonian Univ., Poland
- ¹⁴Univ. Federico II and INFN - Napoli, Italy
- ¹⁵Kind Saud Univ, Saudi Arabia
- ¹⁶INFN - Catania, Italy
- ¹⁷INFN - Catania Gr. Coll. Messina

FAZIA-SYM : Isoscaling probe



Mark Boissjoli, PhD

$$\frac{C_{\text{SYM}}}{T} = \frac{\alpha/4}{\left(\frac{Z}{\langle A_1(Z) \rangle}\right)^2 - \left(\frac{Z}{\langle A_2(Z) \rangle}\right)^2}$$

A. Ono and al. PRC 68, 051601(2003)

