

# Digital Pulse Shape Analysis with HYDE Detector

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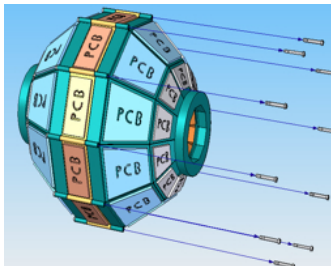
Universidad  
de Huelva

- 1 HYDE Telescope.
  - Telescope structure
  - Detectors main characteristics
- 2 Studying the performance of each stage.
  - 1<sup>st</sup> joint experiment HYDE-GASPARD-TRACE
  - DSSD 100  $\mu\text{m}$  & 20  $\mu\text{m}$
- 3 Next Experiments.
  - PSA DACQ system
  - Italian campaign
- 4 Latest developments.
  - Making the trapezoidal shape detectors

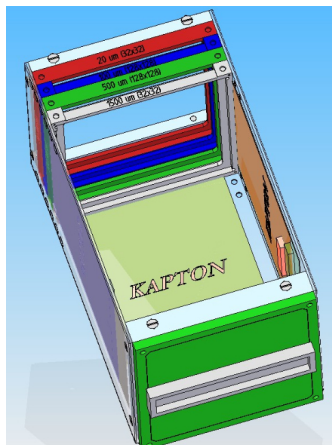
# HYDE Telescope

## HYbrid DETector Array

- LEB of FAIR (if?), fits in AGATA.
- 4 DSSD Si telescope (640 chns/cell).
- Z & A identification from H to S.
- E &  $\phi$  resolution:  $< 50$  keV,  $1^\circ/0.1^\circ$ .

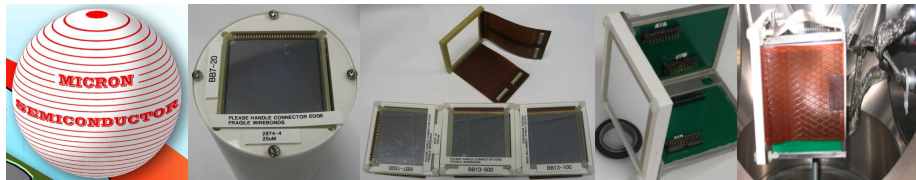


- Theoretical design -



- Cell prototype -

# Detectors main characteristics

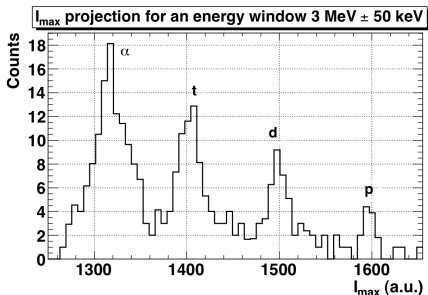
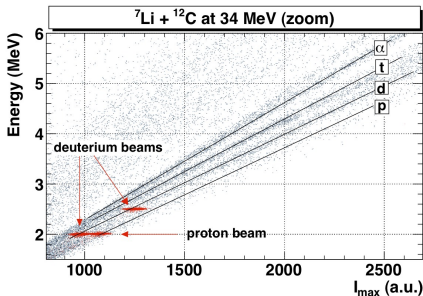


|                                     | BB7-20    | BB13-100               | BB13-500               | BB7-1500  |
|-------------------------------------|-----------|------------------------|------------------------|-----------|
| <b>Wafer type</b>                   | FZ        | 6 inch (nTD)           | 4 inch (nTD)           | FZ        |
| <b>Crystal orientation</b>          | < 100 >   | < 100 ><br>8° off-axis | < 100 ><br>8° off-axis | < 100 >   |
| <b>Resistivity</b>                  | 3 kΩ cm   | 200 Ω cm               | 2 kΩ cm                | 20 kΩ cm  |
| <b>Measured thickness</b>           | 22 μm     | 101 μm                 | 511 μm                 | 1531 μm   |
| <b>Active area (mm<sup>2</sup>)</b> | 62 × 62   | 62 × 62                | 62 × 62                | 62 × 62   |
| <b>Strips</b>                       | 32 × 32   | 128 × 128              | 128 × 128              | 32 × 32   |
| <b>Metal coverage</b>               | Al 300 nm | Al 300 nm              | Al 300 nm              | Al 300 nm |
| <b>Dead layer</b>                   | < 1 μm    | < 1 μm                 | < 1 μm                 | < 1 μm    |
| <b>Depletion voltage</b>            | 5 V       | 100 V                  | 300 V                  | 300 V     |
| <b>Package material</b>             | FR4       | FR4                    | FR4                    | FR4       |

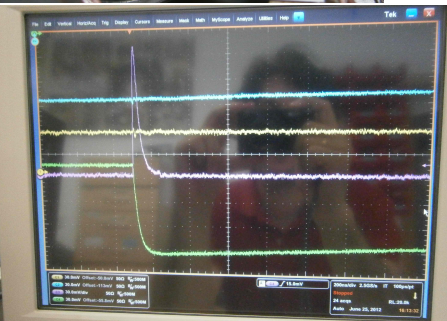
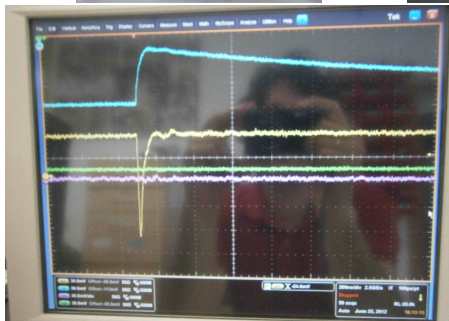
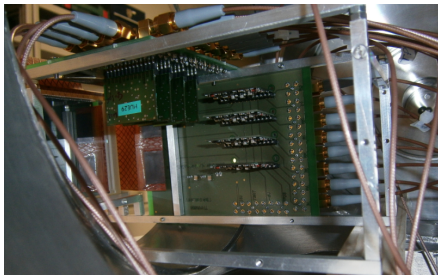
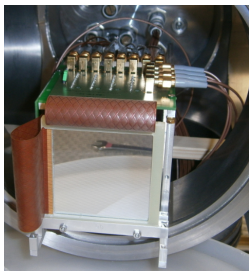
# 1<sup>st</sup> joint experiment HYDE-GASPARD-TRACE

## H isotopic separation with a NTD-500 $\mu\text{m}$

- Lithium beam hitting a carbon target ( ${}^7\text{Li} + {}^{12}\text{C}$ ) at 34 MeV.
- Mono-energetic beams help to identify p & d lines.
- ${}^1,2,3\text{H}$  Well separated at 3 MeV, along with alphas.
- Need more research.
- J.A. Dueñas et al. NIMA 676 (2012) 70



# DSSD 100 $\mu\text{m}$ & 20 $\mu\text{m}$ alpha source test (left n-side, right p-side)



## PSA DACQ system for incoming experiments

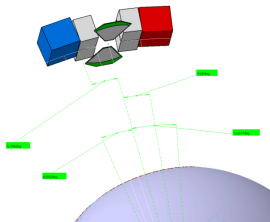


- MBS: RIO3 + TRIVA4, under Go4
- MATAcQs up to 2 GHz
- Input signals  $\pm 1$  V
- Baseline shift to get + or - 2 V
- Limitation regarding counting rate < 300 cps
- Off-line analysis will allow to play with the sampling

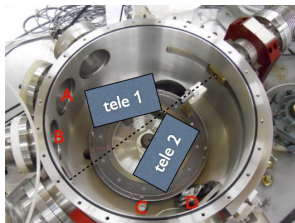
# Italian 2012 campaign

## LN Catania (July)

- Red & blue blocks are HYDE telescopes
- Forward angle  $\approx 9^\circ$
- Protons,  $^4\text{He}$  and  $^{12}\text{C}$  at 60 MeV
- Different set of targets



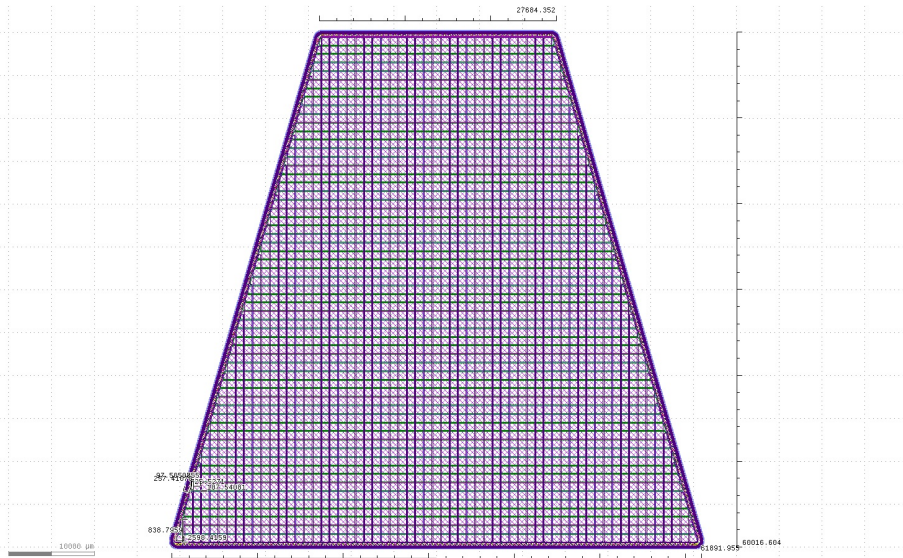
## LN Legnaro (December)



- Forward angle  $25^\circ$ - $30^\circ$
- Beam of  $^{16}\text{O}$  at 130 MeV
- Target made of Li+Si



# Mask design for trapezoidal NTD-500 $\mu\text{m}$ at CNM-Barcelona



# Mask design for trapezoidal NTD-500 $\mu\text{m}$ at CNM-Barcelona

