

# SPIDER

## Silicon Ple DEtectoR



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### Developed by:

- INFN **Firenze** in collaboration with INFN **LNL & Padova**

# The Detector

The Detector

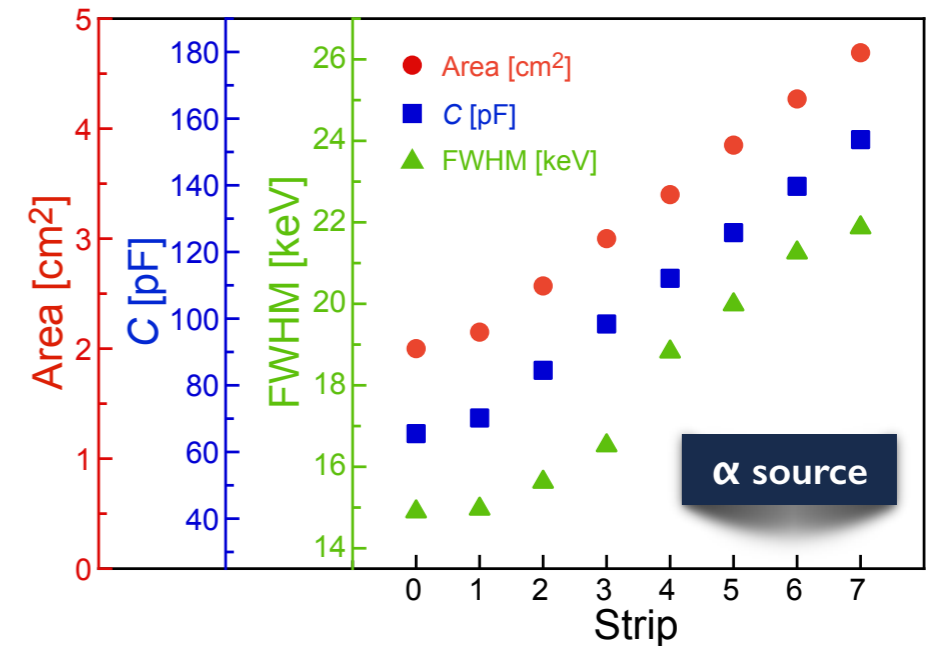
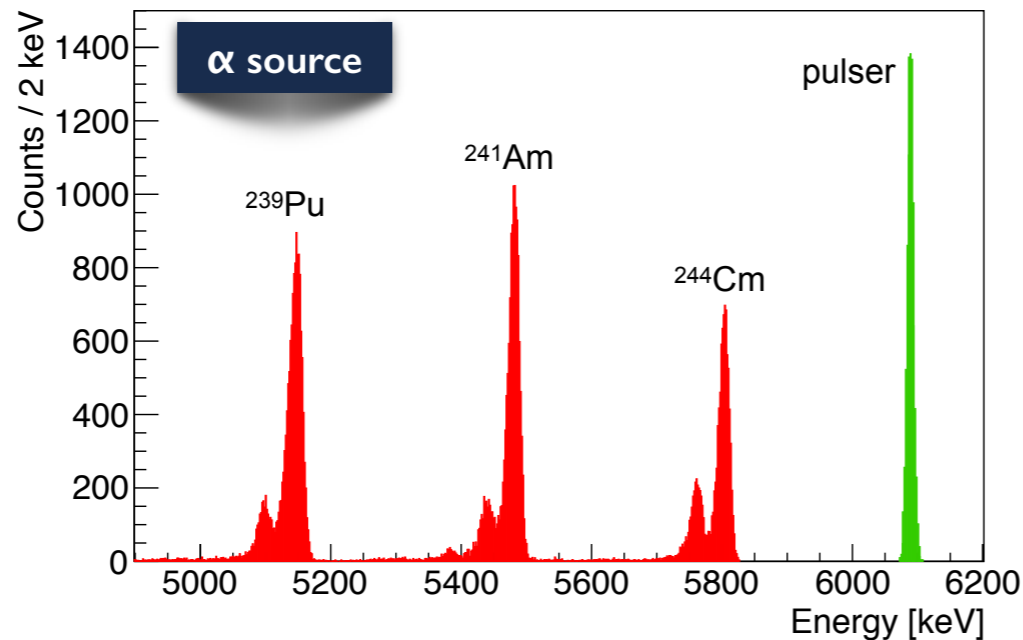
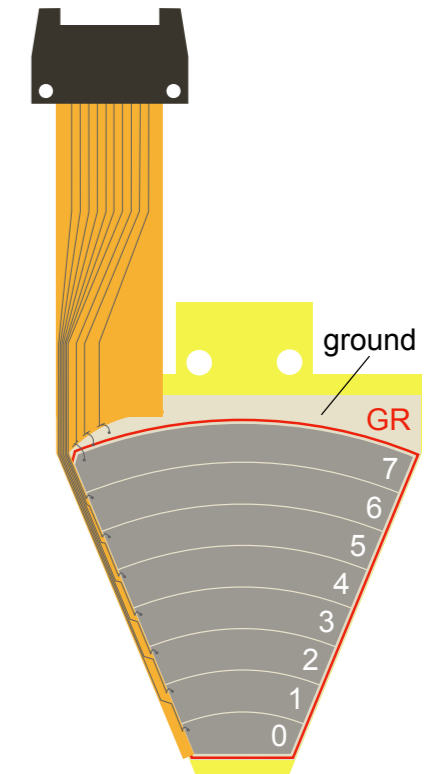
Coulex  
Experiments  
with GALILEO  
@LNL

Configuration  
with AGATA

Mechanics &  
Electronics  
with AGATA

Summary

- ▶ Independent sectors, each with 8 strips + 1 guard ring
- ▶ Thickness ~ 300  $\mu\text{m}$ , dead layers ~ 50 nm in the junction side and ~ 350 nm in the ohmic side
- ▶ Bulk resistivity ~ 3400  $\Omega\text{cm}$
- ▶ Full depletion @ 100 V (recommended bias = 120 V)



*M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., NIMA 971 (2020) 164030*

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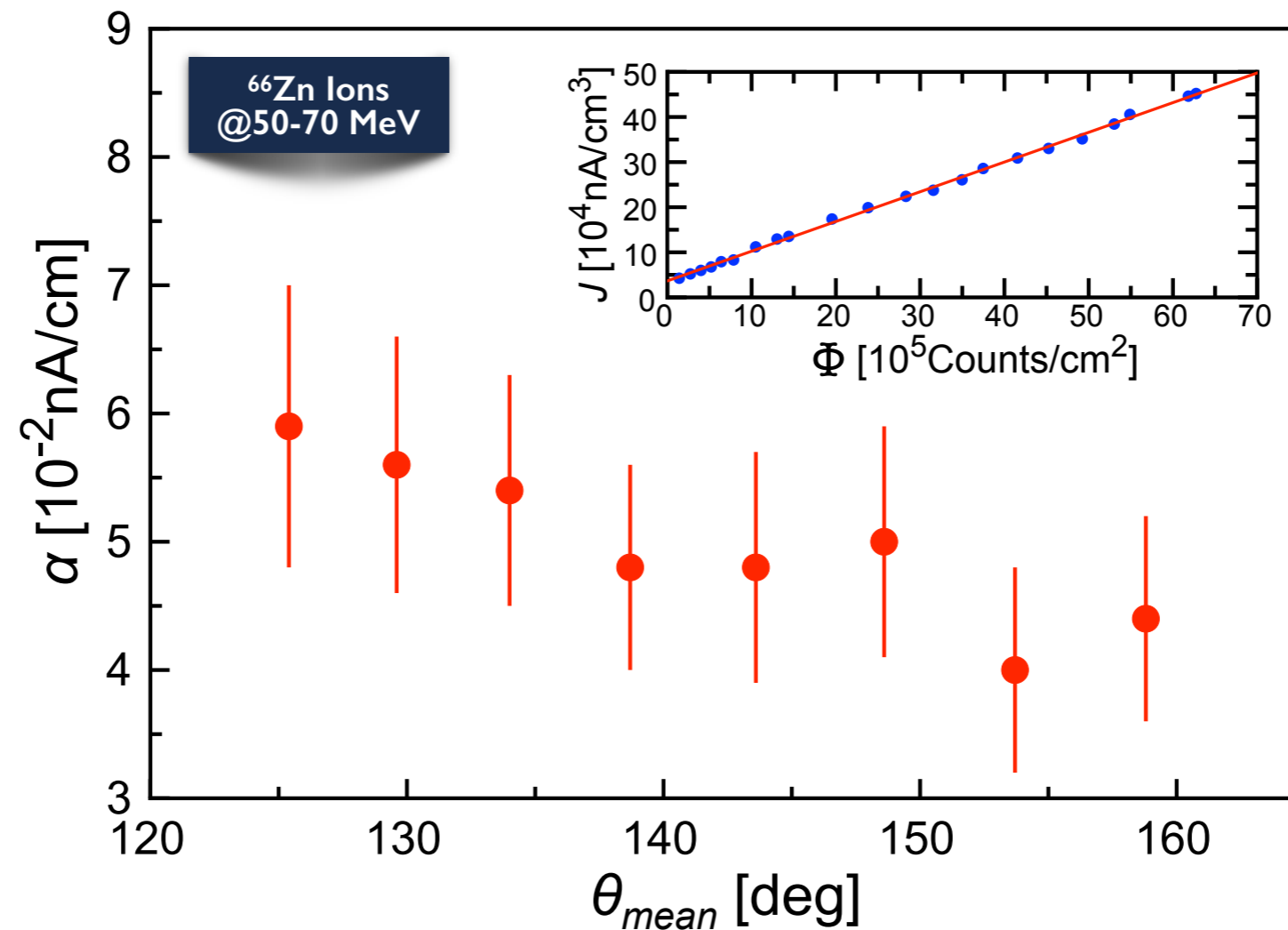
- ▶ Measured damage factors  $\alpha \Rightarrow$  Possible to predict radiation damage effects

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Summary



[M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., NIMA 971 \(2020\) 164030](#)

# The Detector

The Detector

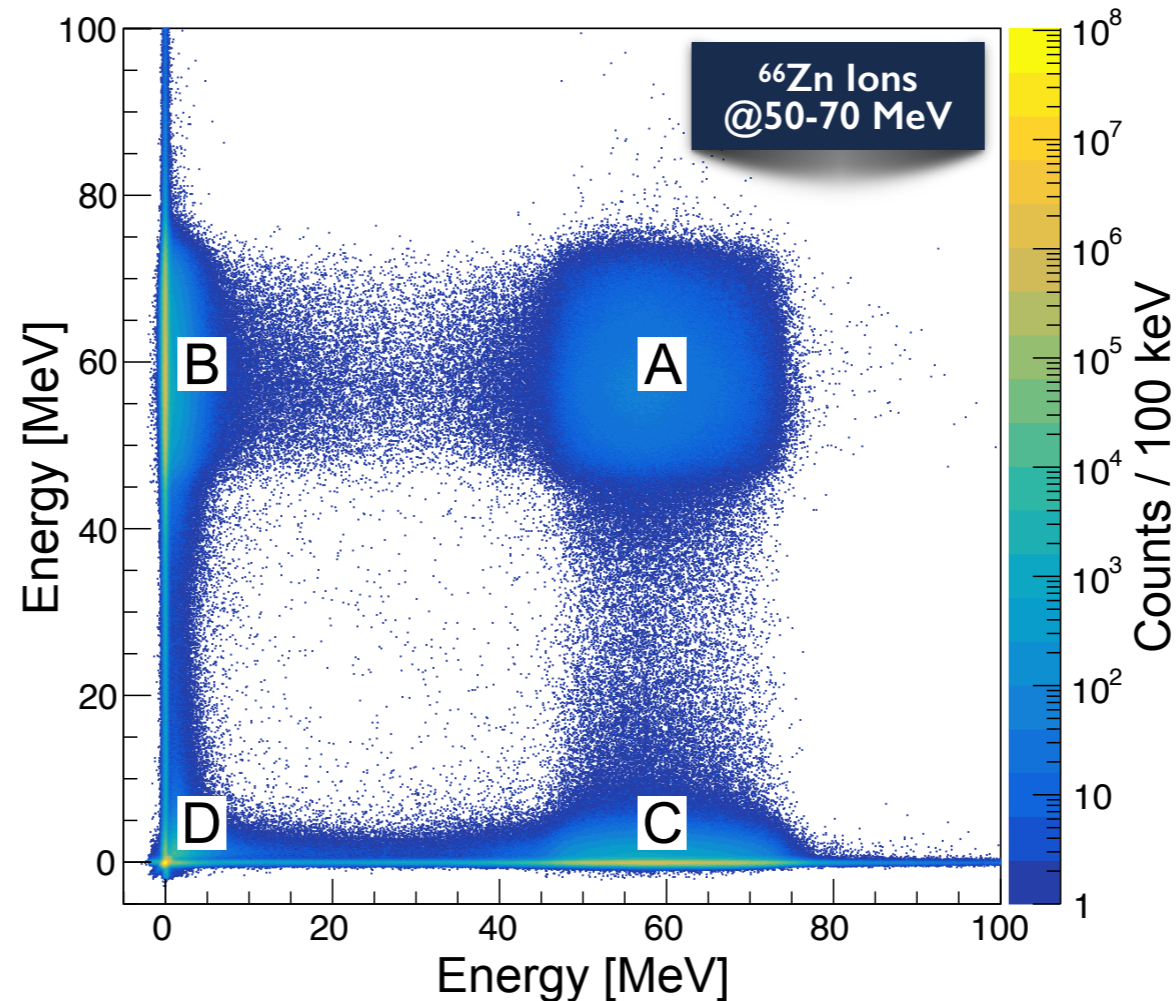
- ▶ Measured damage factors  $\alpha \Rightarrow$  Possible to predict radiation damage effects
- ▶ Heavy-ions — heavy-ions correlations  $\Rightarrow$  No charge sharing effects

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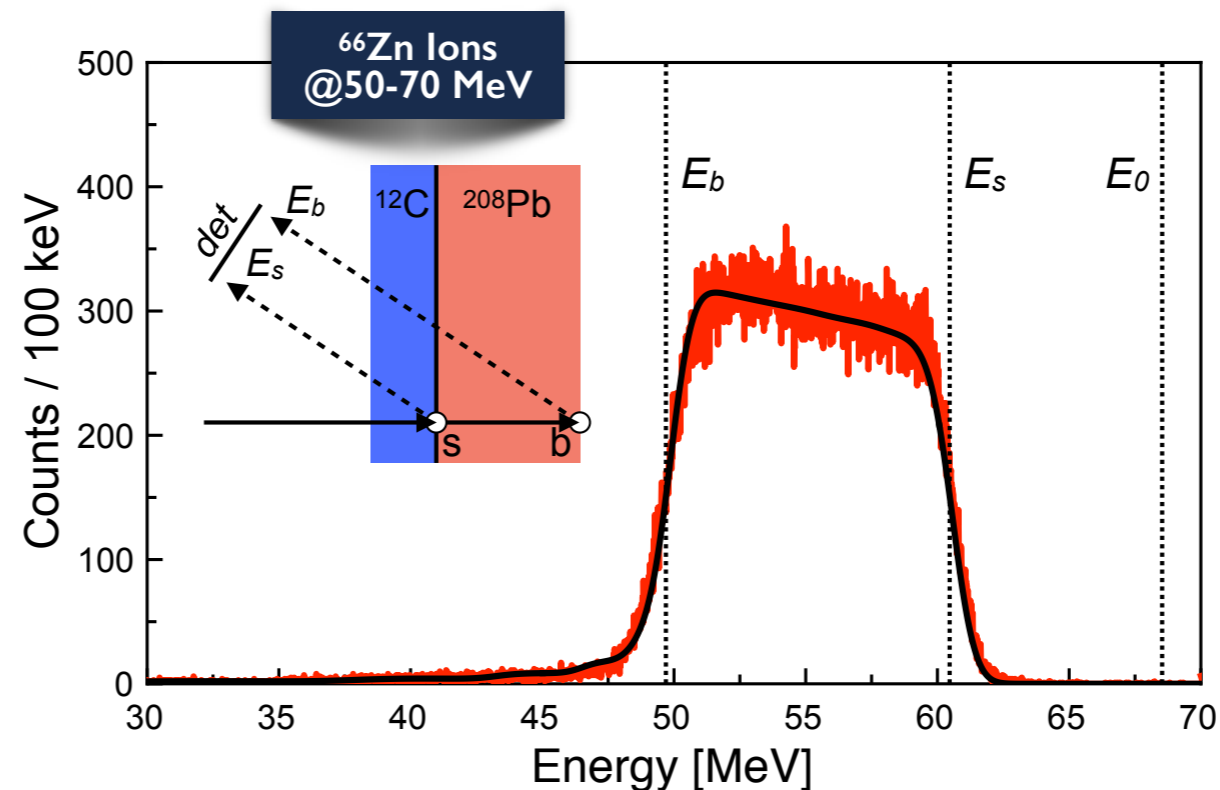
- ▶ Measured damage factors  $\alpha \Rightarrow$  Possible to predict radiation damage effects
- ▶ Heavy-ions — heavy-ions correlations  $\Rightarrow$  No charge sharing effects
- ▶ Possibility to apply the Rutherford backscattering technique to measure target properties

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Summary



[M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., NIMA 971 \(2020\) 164030](#)

[M. Rocchini, M. Chiari, E. Pasquali et al., NIMB 486 \(2021\) 68](#)

# Coulex Experiments with GALILEO @LNL

The Detector

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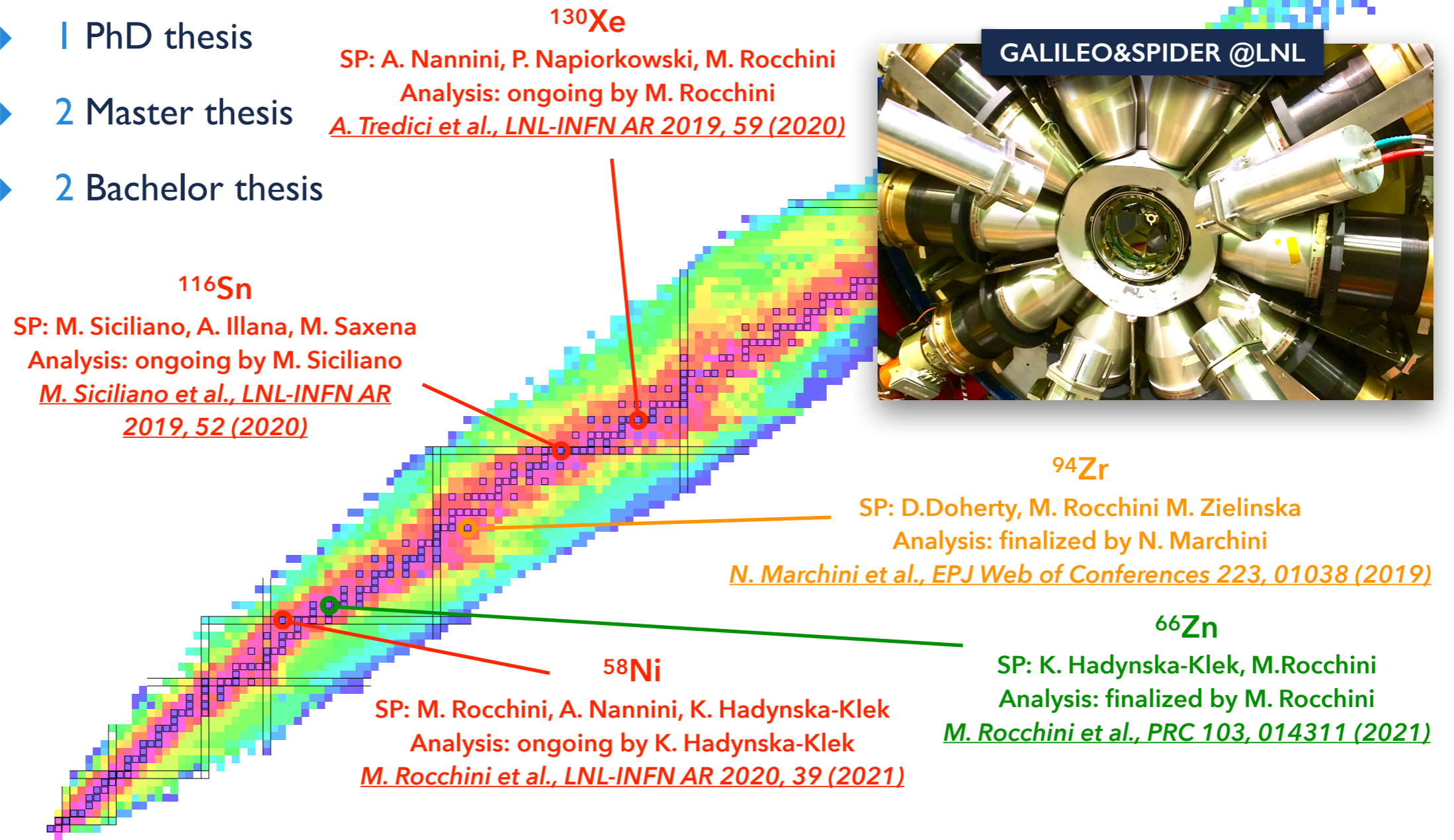
Summary

- ▶ 5 experiments successfully performed

- ▶ 1 PhD thesis

- ▶ 2 Master thesis

- ▶ 2 Bachelor thesis



*A. Nannini, M. Rocchini, K. Hadyńska-Klęk et al., Phys. Scr. 95 (2020) 024005*

# Configuration with AGATA

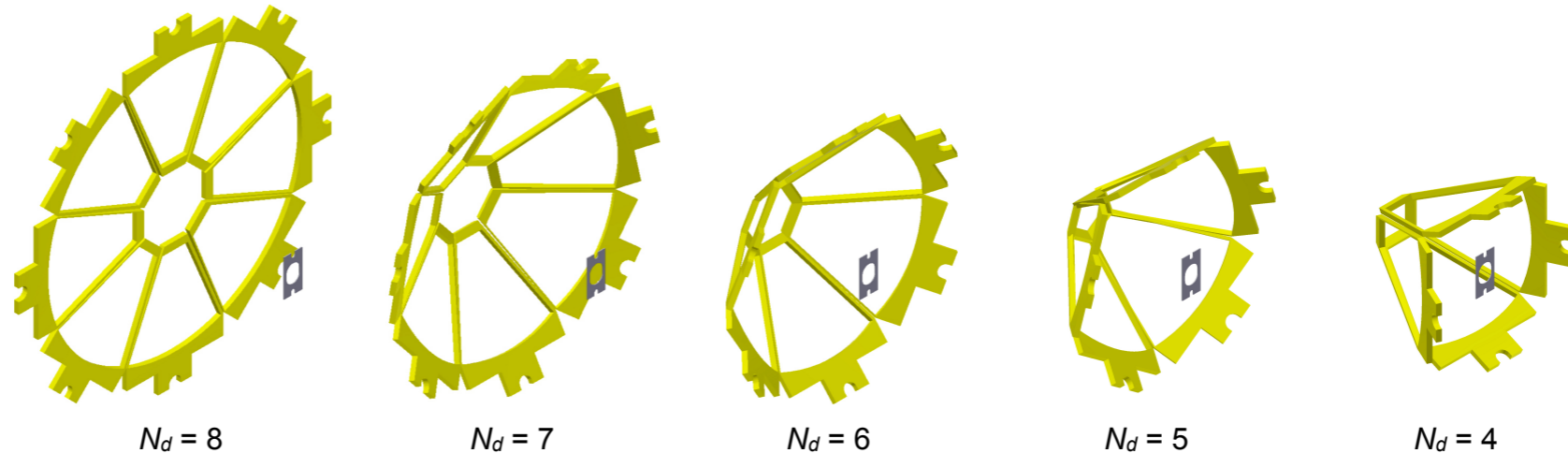
The Detector

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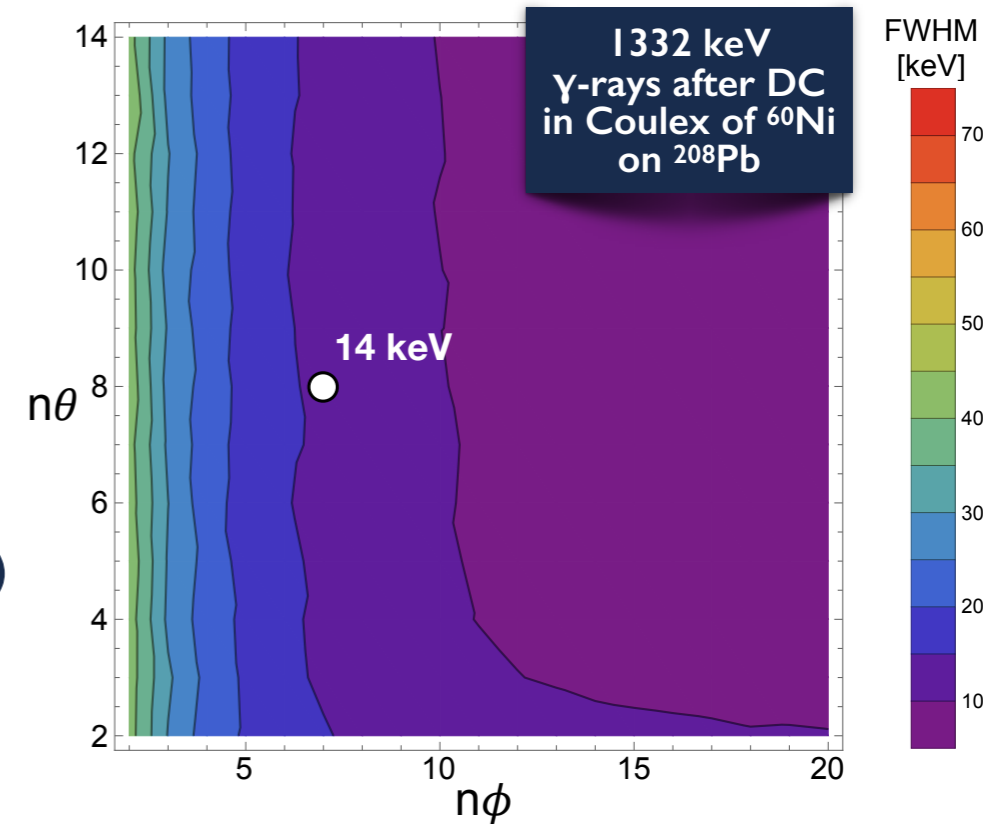
Configuration  
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Mechanics &  
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Summary



- ▶ Geometry chosen as a compromise between angular coverage VS Doppler correction capabilities
- ▶ Cone-like configuration with 7 sectors at backward angles, 8.5 cm from the target (same as for GALILEO)
  - ▶  $\Delta\Theta_{\text{strip}} = 4.0 - 5.1^\circ$ ,  $\Delta\phi_{\text{sector}} = 2\pi/7$  ( $51.4^\circ$ )
  - ▶  $123.5^\circ < \Theta_{\text{tot}} < 161.3^\circ$
  - ▶  $\Omega_{\text{tot}}/4\pi = 17.3\%$



*M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., NIMA 971 (2020) 164030*

# Mechanics & Electronics with AGATA

The Detector

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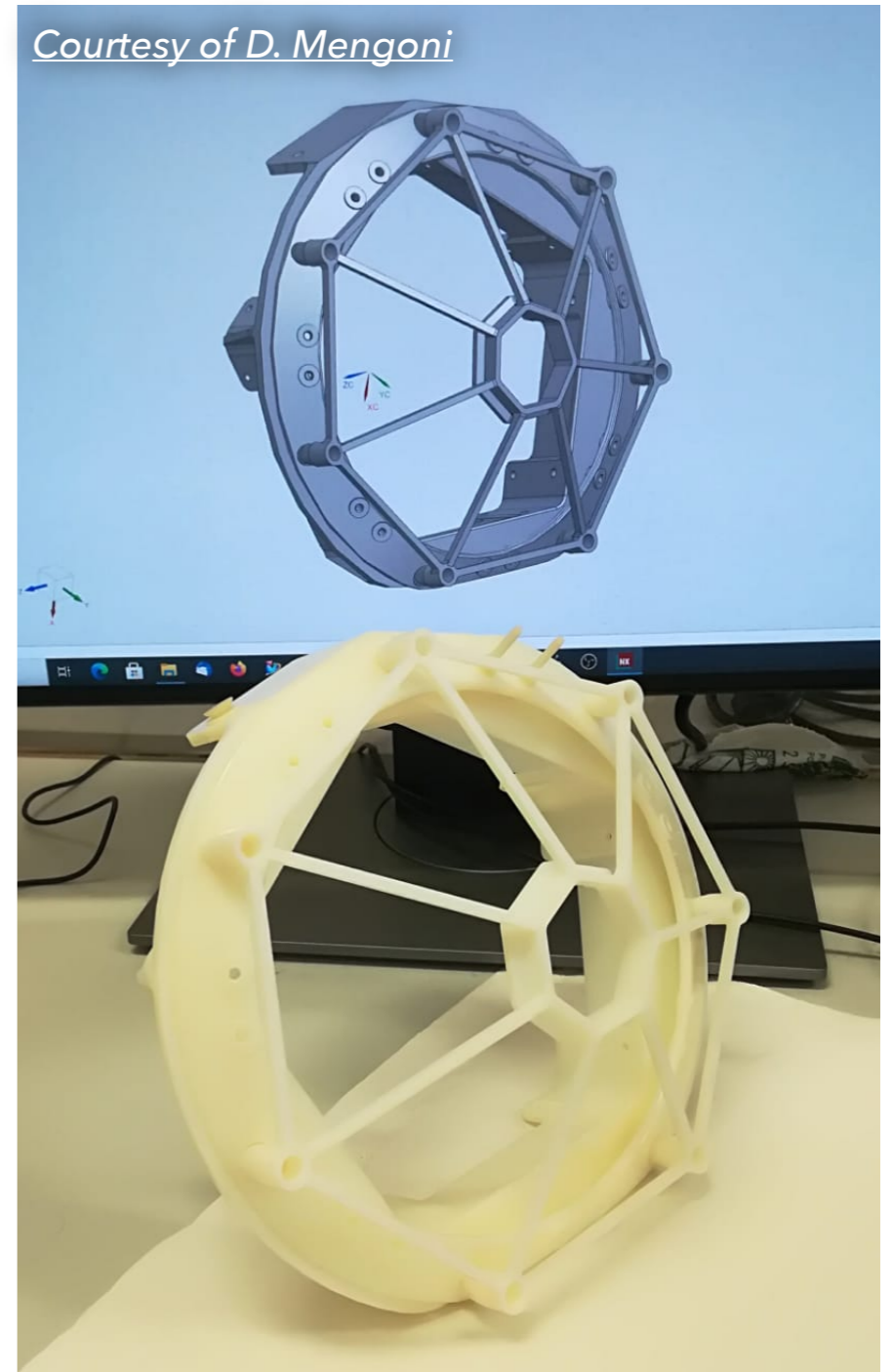
Configuration  
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Mechanics &  
Electronics  
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Summary

- ▶ Channels: 63 using GGP or 56 using VI725
- ▶ Dedicated preamplifiers developed by INFN Milano (C. Boiano)
- ▶ New mechanical holder developed by INFN Milano and Padova (D. Mengoni, G. Benzoni)
- ▶ Possibility to couple SPIDER with other ancillaries under study:
  - ▶ SPIDER+DANTE: e.g., Coulex with particle detection at backward and forward angles
  - ▶ SPIDER+GAL-TRACE: e.g., transfer with large angular coverage
  - ▶ SPIDER+Plunger: e.g., lifetime measurements in Coulex or transfer

*Courtesy of D. Mengoni*





# Summary

The Detector

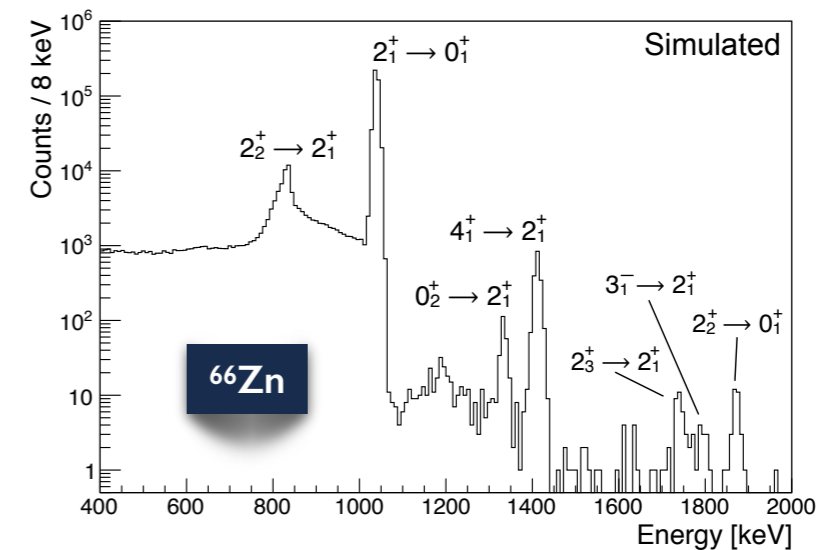
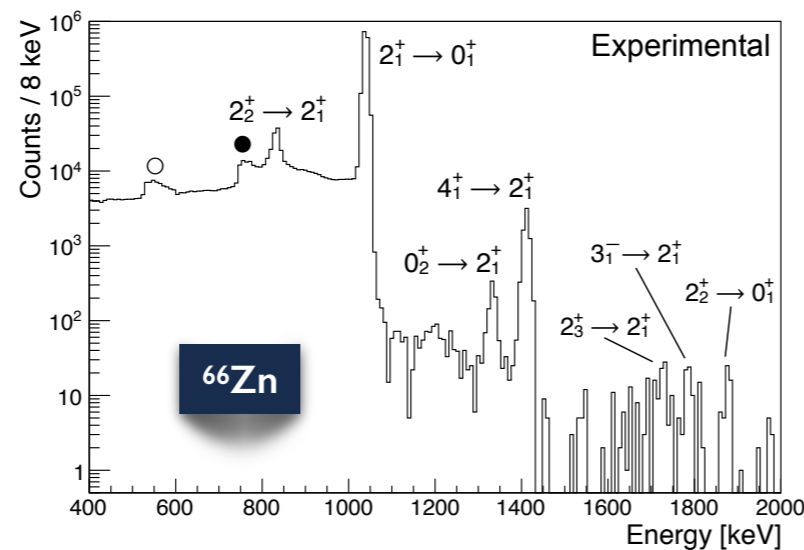
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Summary

- ▶ Development of **electronics** (C. Boiano) and **mechanics** (D. Mengoni, G. Benzoni) in advanced stage
- ▶ **Coupling with other ancillaries** under investigation (DANTE, GAL-TRACE, Plunger)
- ▶ **6 LoI** request SPIDER
- ▶ To do: update existing geometry in **GEANT4 simulations** (F. Crespi, S. Bottoni, E. Gamba, M. Balogh, A. Goasduff, J. Ljungvall)



[M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., NIMA 971 \(2020\) 164030](#)

[M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., Phys. Scr. 92 \(2017\) 074001](#)

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# THANK YOU FOR THE ATTENTION

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