



Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Legnaro

THE DIFFERENTIAL PLUNGER

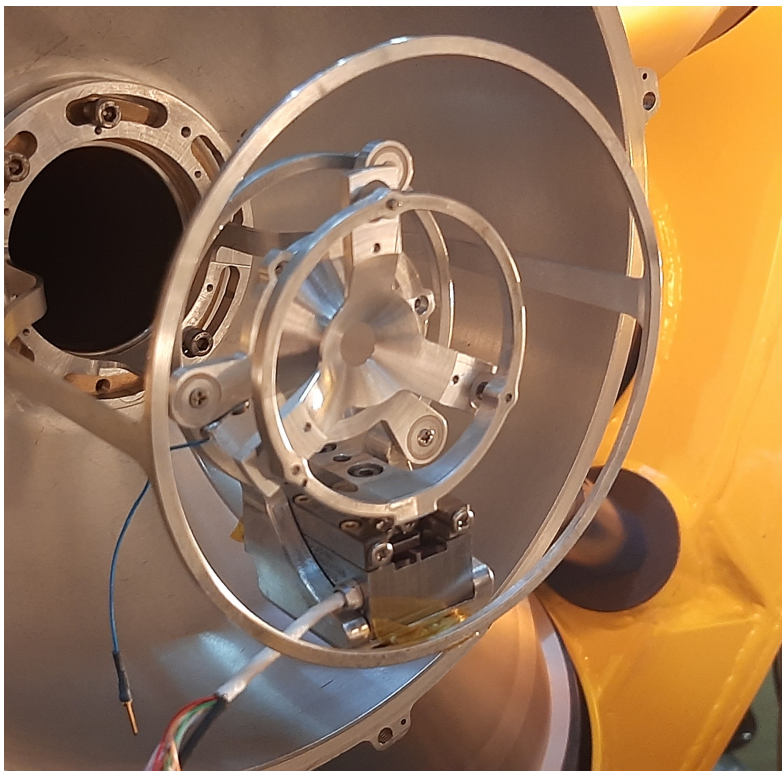
CONTACT PERSON: IRENE ZANON

PRE-PAC WORKSHOP FOR AGATA@LNL

8 – 10 NOVEMBER 2021



THE DIFFERENTIAL PLUNGER

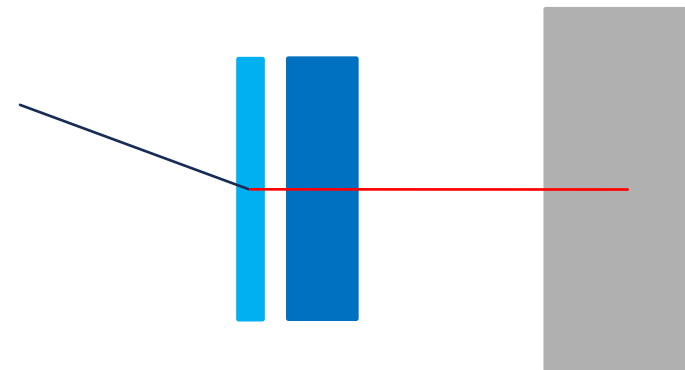


- Suitable for lifetimes in the range of picoseconds using RDDS;
- Developed in Ikp Cologne + LNL;
- Distances from 10-15 μm to 1 cm;
- Precision: 150 nm;
- Active feedback below 100 μm ;
- New mechanics for AGATA+PRISMA.

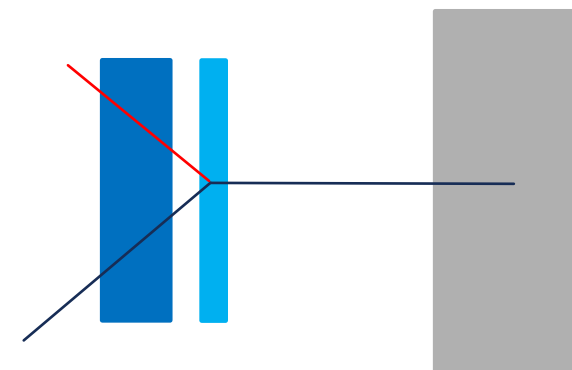
*C. Muller-Gatermann, Nucl. Instr. Meth. A **920**, (2019)*

PLUNGER + PRISMA

- Plunger angles: from 0° to 50° ;
- Energy of the beam after degrader must be considered carefully;
- Possibility to run both in «direct» plunger and «inverse» plunger;
- Lifetime measurement of beam-like or target-like recoil, depending on the kinematic;
- In inverse plunger configuration some detectors cannot be used for RDDS measurement.



Direct plunger



Inverse plunger

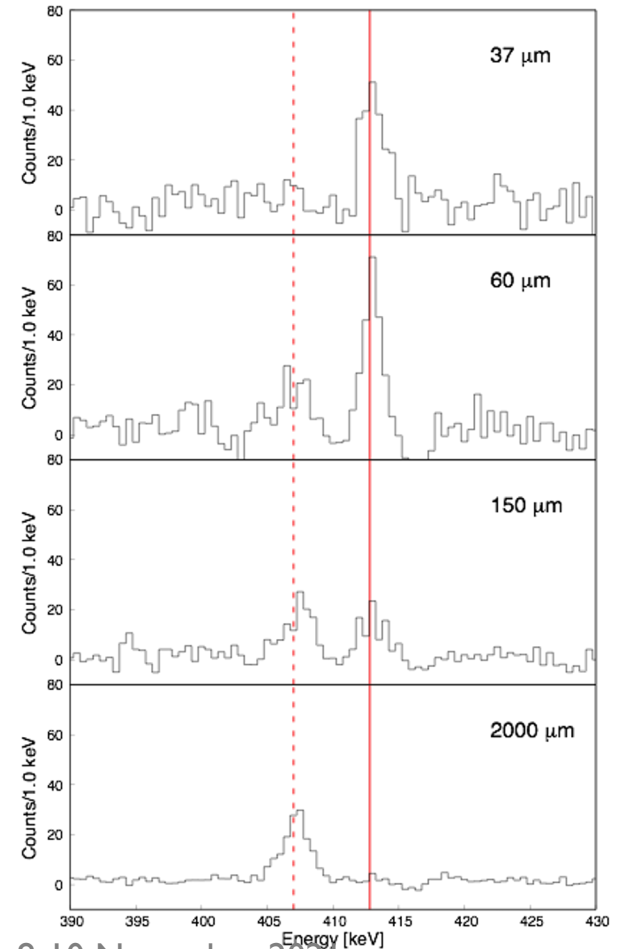
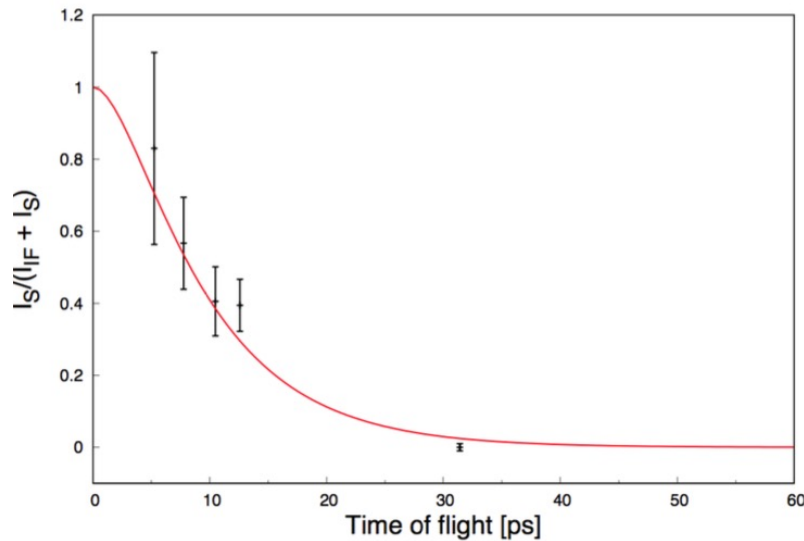
GALILEO + PLUNGER



- 6 experiments GALILEO + Plunger;
- Commissioning: (C. Muller-Gatermann, Nucl. Instr. Meth.A **920**, (2019));
- Testov: Plunger + EUCLIDES; Lifetimes in ^{113}I (J. Bradbury *et al*, NIMA **979** (2020));
- John: Plunger stand-alone; Lifetimes in ^{188}Hg (M. Siciliano, PRC **102** (2020));
- Gottardo: Plunger + EUCLIDES; Lifetimes in ^{105}Sn ;
- Werner: Plunger stand-alone; Lifetimes in ^{170}W ;
- Gottardo: Plunger + SPIDER; Lifetimes in ^{83}Se .

PLUNGER STAND-ALONE

- GALILEO + PLUNGER;
- Fusion-evaporation reaction;
- Lifetime measurements in ^{188}Hg .



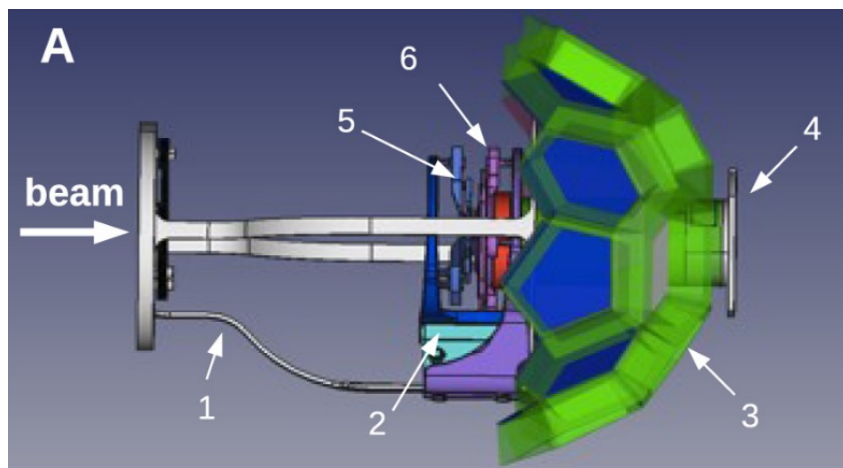
M. Siciliano, PRC 102 (2020)

PLUNGER + EUCLIDES

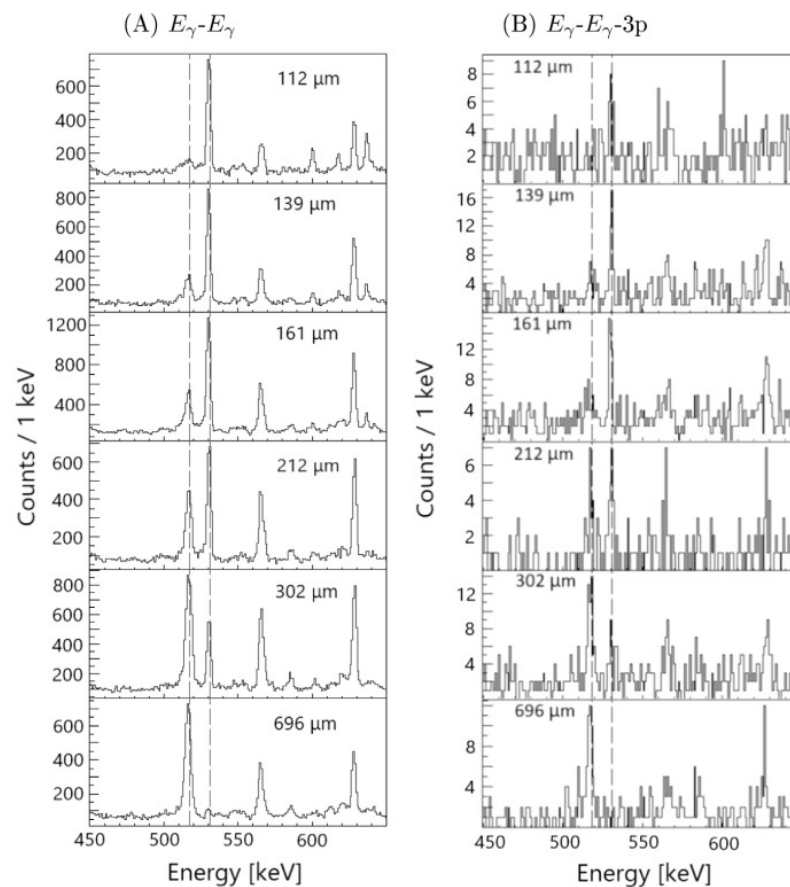


Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali di Legnaro

- GALILEO + EUCLIDES + PLUNGER;
- EUCLIDES at forward angles;
- Lifetime measurements in ^{113}I .

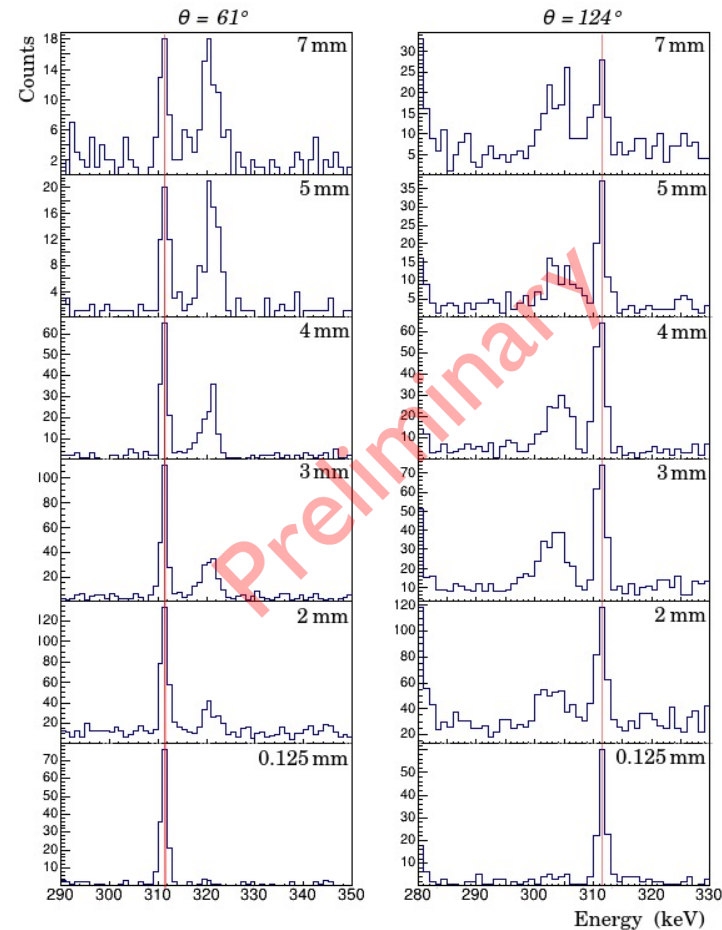
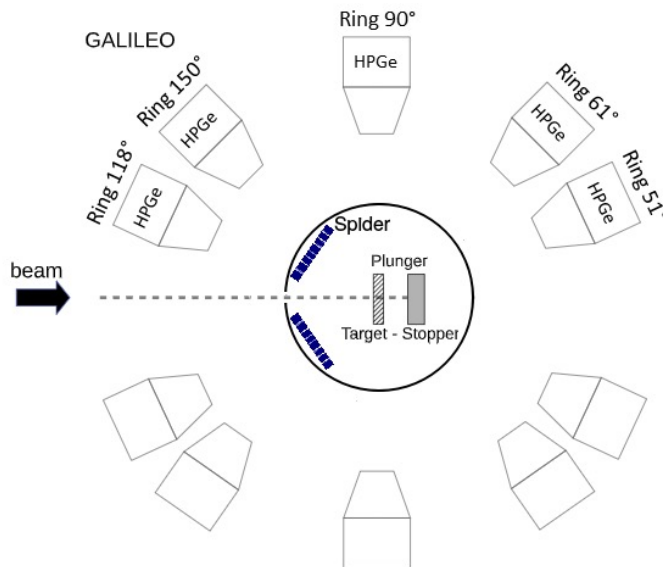


J. Bradbury *et al*, NIM A **979** (2020)



PLUNGER + SPIDER

- GALILEO + SPIDER + PLUNGER;
- SPIDER at backward angles;
- Lifetime measurements after direct reaction in ^{83}Se .



Courtesy of J. Pellumaj

PRE-PAC LETTERS OF INTENT



- 16 Lol AGATA + PRISMA + Plunger;
- 1 Lol for Plunger + TRACE (Werner);
- 1 Lol for Plunger + SPIDER (Pasqualato);
- 1 Lol for Plunger + DSAM target (Galtarossa);
- 3 Lol for Plunger in inverse configuration (Brugnara, Pellumaj, Sedlak).

EXPERIMENTAL CAMPAIGN 2022



- Plunger available for the first experimental campaign;
- Motor already used for in-beam experiment;
- Possibility to run in «inverse» plunger mode;
- Working on the coupling with SPIDER at backward angles;
- Target and degrader produced at LNL for the GALILEO campaign using evaporation and/or rolling techniques;
- Materials must be discussed with the local group (irene.zanon@lnl.infn.it) and M. Loriggiola (massimo.loriggiola@lnl.infn.it) for production in-situ.



THANK YOU FOR YOUR
ATTENTION