

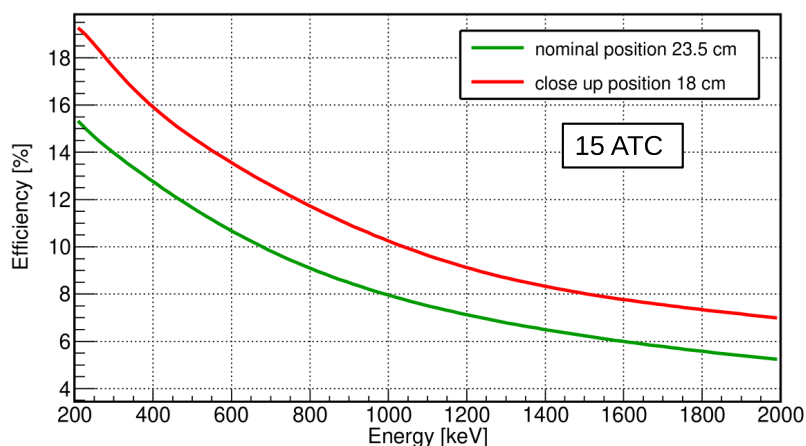
AGATA pre-PAC meeting technical information for the preparation of the proposals

The present document is a guide line for the preparation of the proposals for the AGATA@LNL pre-PAC that will take place at LNL in November 8th to 10th 2021. AGATA will be coupled to a series of complementary detectors that will allow to perform a broad physics program.

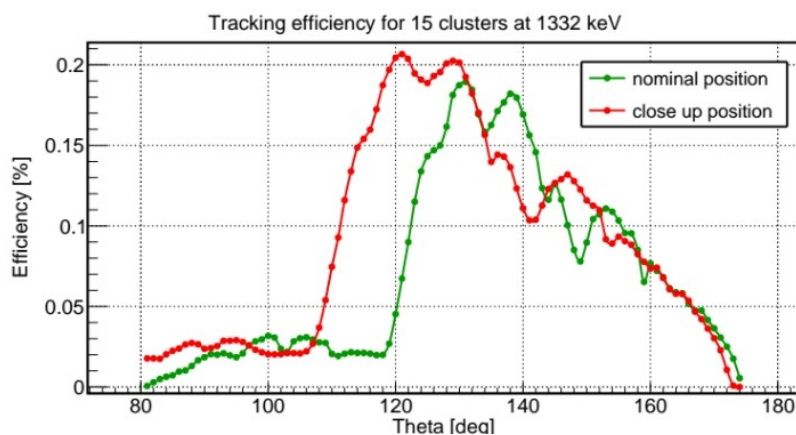
Stable beams from TANDEM and TANDEM-ALPI-PIAVE will be available up to ²⁰⁸Pb (2022) and ²³⁸U from 2023. The list of beams, intensities, energies are listed in: https://www.inl.infn.it/images/tandem_piave_alpi_beams_agata_v2.pdf
For any additional information, please contact the Linac operation team (PACbeams@Inl.infn.it)

AGATA efficiency

In the following picture the simulated efficiency curves for the AGATA configurations at LNL are displayed (red line: close up position, green line: nominal position). The angles of the crystals range from 88° to 165.9° for the nominal position and from 75° to 143.2° for the close-up position.



AGATA efficiency as a function of the theta angle for the nominal and close up positions at 1,3 MeV. For a more realistic efficiency curve look into the report: https://agenda.infn.it/event/36457/attachments/107698/154415/AGATA@LNL_Efficiency_Report.pdf



Reaction chamber configuration

Scattering chamber made of Aluminium, outer radius 170 mm thickness 2 mm.

Movable shells to cover angles between 20-88 degrees.

Close-up position (18 cm) only available from 32 to 88 deg.

Nominal position (23.5 cm) available from 20 to 84 deg.

Complementary detectors

- PRISMA [vacuum mode]:
solid angle of ~ 80 msr, corresponding to an acceptance of $\Delta\theta = 12$ deg in the dispersion (horizontal) plane and $\Delta\phi = 22$ deg in the vertical plane. Wide momentum ($\pm 10\%$) and energy ($\pm 20\%$) acceptance. Maximum Brho = 1.2 Tm. Dispersion $\Delta p/p \approx 4$ cm/%. Energy resolution up to 1/1000 (via TOF). Nuclear charge (Z) resolution $\approx 1/60$. Mass (A) resolution $\approx 1/250$. Rotation around the target from 20-88. Rate capability up to 3 kHz. For further details: A. Stefanini et al., Nuc Phys A, 701 (2002) 217 and S. Szilner et al., Phys Rev C77 (2007) 024604.
- Gamma-ray scintillators:
6 x LaBr₃:Ce (3"x3"): $\sim 0.8\%$ efficiency for 1 MeV gamma ray at 25.5 cm. Time resolution ~ 700 ps. Energy resolution $\sim 3\%$ at 662 keV.
Other possible detectors which use should be discussed are: 8 X LaBr₃:Ce (2"x2"). Time resolution ~ 500 ps. Energy resolution $\sim 3\%$ at 662 keV.
For further details: A. Giaz et al. NIMA Volume 729, 21 November 2013, Pages 910-921
- SPIDER:
Single layer 300-um thick segmented silicon detector for low-energy Coulomb excitation experiments. The angular coverage in the polar angle is 124 - 161 degrees and the covered solid angle is 17% of 4pi. The configuration consists of 7 detectors arranged in a cone-like configuration at 10 cm from the target. For further details for experiments with AGATA please look at: M. Rocchini, K. Hadynska-Klek, A. Nannini et al., NIMA 971 (2020) 164030.
- DANTE MCPs:
Heavy-ion charged-particle detectors with position resolution $\lesssim 1$ mm, timing resolution ≈ 130 ps. Up to 8 MCPs in a ring configuration, 40x60 mm² each MCP; angular coverage is modular, can go to forward angles. Configuration with DANTE in forward angles and SPIDER in the backward angles under study. For further details: A. Gottardo et al. Nuclear Physics A805, 606 (2008).
- Plunger:
range from micrometers to 1.2 cm. Coupling with particle detectors under study. For further details please see: A. Dewald, O. Moeller, P. Petkov, Progress in Particle and Nuclear Physics 67 (2012) 78.
- GAL-TRACE highly-segmented silicon det. telescopes (up to 5 units):
Telescope unit: DE(100 mm)-E(1.5mm) . PSA available for light charged particles up to Oxygen. Angular coverage: 22°. Angular resolution: 1.5°. Energy resolution (241Am) ~ 30 keV average. Solid angle coverage in a barrel configuration ($\sim 90^\circ$ polar

angle approximately) about 6%, coupling with SPIDER possible. Time resolution few ns. For further details: A. Goasduff et al., in preprint is in the pre-PAC WS web page.

- EUCLIDES DE-E silicon det. telescopes (with beam absorbers):
absolute proton efficiency (reaction dependent) ~ 60%; absolute alpha efficiency 25% (reaction dependent). Average energy resolution (241Am source): ~120 keV average. Lower detection threshold under experimental conditions: few MeVs.
EUCLIDES plunger configuration (with beam absorbers) Eff_p = 25% Eff_alpha = 15%. Reference D.Testov et al., EPJA 55, (2019) 47.