

AGATA Pre-PAC meeting technical information for the proposals preparation

The present document is a guideline for the preparation of the proposals for the 6th AGATA@LNL Pre-PAC that will take place at LNL from November 18th to 19th 2024. AGATA will be coupled to a series of complementary detectors that will allow to perform a broad physics program.

During this period, **beams from the TANDEM accelerator and from the EXOTIC facility will be available** at LNL, and AGATA is expected to consist of a minimum of 15 triple clusters (1π solid angle coverage).

The list of TANDEM beams, intensities, energies are listed in:

https://agenda.infn.it/event/43603/attachments/126672/187082/Fasci_TAP.pdf

The list of EXOTIC beams, intensities, energies are listed in:

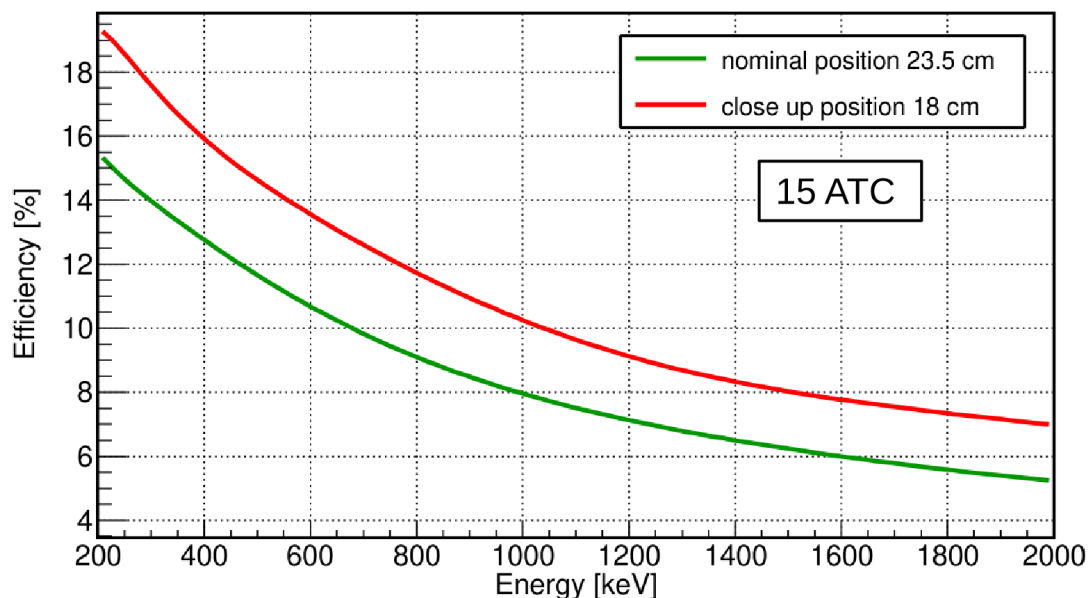
https://agenda.infn.it/event/43603/attachments/126672/187083/prePAC_EXOTIC.pdf

For any additional information, please contact the Linac operation team

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AGATA efficiency

In the following pictures the simulated efficiency curves for the AGATA configurations at LNL, with 15 ACTs, 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. The first picture shows the energy dependence of AGATA efficiency.



In the second picture, the AGATA efficiency as a function of the theta angle for the nominal and close up positions at 1,3 MeV is displayed.

For a more realistic efficiency curve look into the report:

https://agenda.infn.it/event/39886/attachments/115692/166548/AGATA_Performance_Efficiency_PT.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 $\Delta p/p \approx 4\%$. 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 C 76 \(2007\) 024604](#).

- Gamma-ray scintillators:

6 x LaBr₃:Ce (3"x3") ~ 0.8 % efficiency for 1 MeV gamma ray at 25.5 cm. Time resolution ~ 700 ps. Energy resolution ~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 ~3% at 662 keV.

For further details: [A. Giaz et al. NIM A Volume 729 \(2013\)](#)

- 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: [M. Rocchini, K. Hadynska-Klek, A. Nannini et al., NIM A 971 \(2020\) 164030.](#)

- DANTE MCPs:

Heavy-ion charged-particle detectors with position resolution ≤ 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 A 805, 606 (2008).

- Plunger:

range from micrometers to 1.2 cm. Coupling with particle detectors under study.

For further details: [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 (~90 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%.

For further details: [D. Testov et al., EPJA 55. \(2019\) 47.](#)

- SAURON annular DSSDs:

3 thickness available: 300, 500 and 1500 um. Geometrical position ± 5 cm from target, covering angles from 25 to 45 degrees (forward) and/or 135 to 155 degrees (backward). The position can be slightly adjusted, following the indications of the local responsables.

For further details: <https://www.micronsemiconductor.co.uk/product/s1/>