CTADIR:

Cryogenic target for ^{3,4}He. The gas is at a pressure of max 1 atm and at a temperature of 9 K. The gas is contained by windows made of 3.8 μm HAVAR (2 μm thickness also possible), 1 cm in diameter. The distance between the windows is 4 mm. The maximum target density is around 5E20 at/cm^2. Use of ^{1,2}H to be explored. The target is conceived to be employed in combination with AGATA, GRIT and other ancillaries. The target body allows an aperture cone of +/-70 degrees for outgoing ejectiles, in both forward and backward directions. The target can be tilted with respect to the beam axis, to measure scattering around 90 degrees.
Further information: M. Sedlak et al., Il Nuovo Cimento 45C (2022) 108.

Contact person: Andrea Gottardo (andrea.gottardo@lnl.infn.it)

CHYMENE:

Windowless cryogenic semisolid target for ^{1,2}H. The gel-like hydrogen or deuterium is extruded into the chamber as 50-100 μm film. The target thickness is around 2-5E20 at/cm^2 max. The integration of the targets with AGATA and other ancillaries is under study, as part of an agreement with CEA Saclay. The evaporation in the chamber implies that ancillary detectors must be capable of operation in bad vacuum (10^{-2}-10^{-3} mbar).
Further information: A. Gillibert et al., Eur. Phys. J. A (2013) 49: 155

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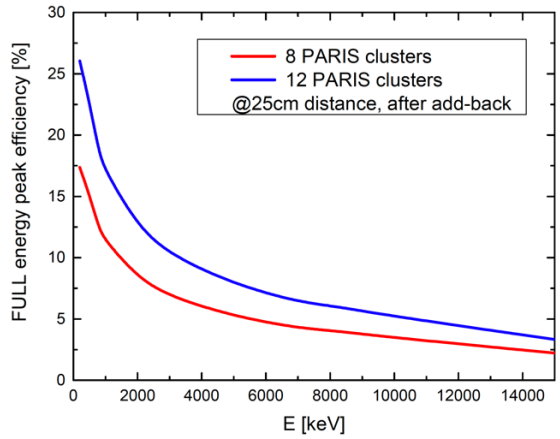
ROTATING TARGET:

The use of a rotating target for intense beams and/or low-melting point targets is under study. It will be compatible with AGATA and other ancillaries.

PARIS:

PARIS consists of clusters, each of 9 $LaBr_3$-NaI or $CeBr_3$-NaI phoswiches (2”x2”x8”). For the AGATA@Legnaro campaign up to 12 clusters at the distance of 25 cm from the target in two configurations (depending on available space) are envisaged: either 8 clusters in a ring geometry at 90 degrees, or 12 clusters: 8 in the ring geometry at 90 degrees and 4 in the wall geometry at forward angles. The full peak efficiency, after add-back, for both configurations is shown in the plot.



PARIS energy resolution: FWHM/E ≈ 4.5% (@ 662 keV)
PARIS time resolution: FWHM = 0.5 ns (for ^{60}Co)
Covered angles: between 75° to 105° (ring) and 10° to 45° (forward wall)
Opening angle of one detector: ~10°
Further information: F. Camera and A. Maj, "PARIS White Book"
https://rifj.ifj.edu.pl/handle/item/333

Contact persons: Adam Maj (adam.maj@ifj.edu.pl), Franco Camera (franco.camera@mi.infn.it)

SUGAR (SUpersonic GAs jet target):

Differential Vacuum System

Differential vacuum system (D.V.S) is a sequence of 3 LF200 chambers connected to a turbo pump (ALCATEL ATP 400 l/s) and 2 high-speed diffusion pumps (Varian M6 1200 l/s each). Vacuum reached from 1.6×10^{-6} Torr (Accelerator line side) to 2×10^{-4} Torr (Jet chamber side).

Jet Vacuum System

High-speed mechanical pump (60 l/s Pfeiffer Hena 200) is connected to the central region of the scattering chamber (catcher).
Gas spilling out of the catcher into the scattering chamber is pumped out from the bottom by a large (13 kW) high speed roots pump (Pfeiffer WKP 4000 AM, 1400 l/s), backed up by a second roots pump (Pfeiffer WKP 1000 AM, 350 l/s) which in turn is backed up by a mechanical pump (Pfeiffer Hena 60, 20 l=s).

Jet Target featuring.

Target thickness around 10^{18} atoms/cm^2. Any gas could be used (with its respective plan to evacuate). Tested for nitrogen, and air gas composition. No gas recovery system. Chamber volume for particle detectors: a sphere of 170 mm^2 radius. Tested for PIPs detector (500 micron) + Surface Barrier detector (12 micron) in a telescope configuration. Vacuum reached inside Jet chamber around 1.15×10^{-1} Torr. FWHM resolution in E-ΔE projected peak around 300 keV.

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NEDA:

NEDA will consist of of 54 detectors covering a solid angle of 1π. For the estimation of the counting rates, efficiency of 1n detection of 30% should be assumed, and a conservative value of 4.5% for 2n.
Further information: J.J. Valiente-Dobón et al., NIMA 927 81 (2019).

Contact person: Daniele Brugnara (daniele.brugnara@lnl.infn.it)

GRIT:

A new-generation silicon detector array GRIT is being built for studies of direct reactions at the European nuclear physics facilities. This device consists of a new type of compact, high granularity, large-acceptance Silicon detectors, combined with new digital electronics allowing PID via embedded PSA. The ultimate GRIT detector assembly is a conical-shaped set of 8 trapezoidal telescopes in both the forward and backward hemispheres with respect to the beam direction, assembled with a ring of squared-shape two-layer silicon telescopes around 90 degrees. The 4π solid angle coverage is achieved with the help of annular detectors as end caps to cover the most backward and forward angles. Integration with cryogenic targets is being considered.
Further information: http://grit.in2p3.fr/
Simulation toolkit: https://nptool.in2p3.fr/

Contact person: F.Galtarossa (franco.galtarossa@pd.infn.it)

Gamma-ray scintillators:

6 $LaBr_3$: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 $LaBr_3$:Ce (2''x2''). Time resolution: ~500 ps. Energy resolution: ~3% at 662 keV.
Further information: A. Giaz et al. NIMA 729 (2013) 910-921

Contact persons: Sara Pigliapoco (sara.pigliapoco@pd.infn.it) and Agnese Giaz (agnese.giaz@mi.infn.it)

SPIDER:

Single layer 300-μm 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 4π. The configuration consists of 7 detectors arranged in a cone-like configuration 10 cm from the target.
Further information, in particular regarding experiments with AGATA: M. Rocchini, K. Hadyńska-Klęk, A. Nannini et al., NIMA 971 (2020) 164030.

Contact persons: Naomi Marchini (naomi.marchini@fi.infn.it) and Matus Balogh (matus.balogh@lnl.infn.it)

DANTE MCPs

Heavy-ion charged-particle detectors with position resolution$\lesssim$1 mm, timing resolution $\approx$ 130 ps. Up to 8 MCPs in a ring configuration, 40x60 mm^2 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.
Further information: A. Gottardo et al., Nucl. Phys. A805 (2008) 606.

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Plunger

Range from micrometers to 1.2 cm. Coupling with particle detectors under study. Further information: A. Dewald, O. Moeller, P. Petkov, Prog. Part. Nucl. Phys. 67 (2012) 78.

Contact person: Irene Zanon (Irene.Zanon@lnl.infn.it)

GAL-TRACE:

Highly-segmented silicon telescopes (up to 5 units).
Telescope unit: ΔE (200 μm) - E (1.5mm). PSA available for light charged particles up to oxygen. Angular coverage: 22º. Angular resolution: 1.5º. Energy resolution (^{241}Am): ~30 keV average. Solid angle coverage in a barrel configuration (~90º polar angle approximately) about 6%, coupling with SPIDER possible. Time resolution: few ns. Further information: A. Goasduff et al., preprint available on the pre-PAC WS web page.

Contact person: Stefano Capra (stefano.capra@mi.infn.it)

EUCLIDES:

ΔE -E silicon telescopes (with beam absorbers).
Absolute proton efficiency ε_p (reaction dependent): ~60%; absolute α efficiency ε_α: 25% (reaction dependent). Average energy resolution (^{241}Am source): ~120 keV average. Lower detection threshold under experimental conditions: few MeV.
EUCLIDES-plunger configuration (with beam absorbers): ε_p = 25% ε_α= 15%.
Further information: D. Testov et al., Eur. Phys. J. A 55 (2019) 47.

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