Advanced Charged-Particle Array at ELI-NP

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- ELI-NP Facility is on schedule: building has been completed and the first stage of the STFC (Daresbury) electron linac due for installation and commissioning.
- The array:
  - High-rate, low-threshold, digital-readout silicon array.
  - Internal scintillator array for coincidence studies.
- Proof of principle experiment scheduled at the HIgS gamma-beam facility [March 2017, co-led by ELI-NP, ORNL, and York].

Physics case overview

High-rate, low-threshold, digital-readout silicon array:

- Astrophysics, (g,p) and (g,a): low threshold necessary.
- Polarised (g,a) to probe GDR: high rate capabilities necessary.
- Gamma-induced fission [joint PhD York/ELI-NP starting 2017]: high rate capabilities necessary and strong links to Nuclear Data.

Internal (in-vacuum) scintillator array [other plans for external array for (g,g')]:

- Gamma-fluorescence, (g,g').
- Gamma-induced pair production.

Combined silicon and (internal) scintillator array:

- Astrophysics: X(g,p)Y(,g), through excited states of final nucleus.
- Combined detection of light ions and high-energy electron(s).
- Facilitates detection of high-energy protons from (g,p) reactions.

Strategic project and UK leadership

STFC is recognising ELI-NP as strategic facility, and it is noted in the Nuclear Physics Roadmap that:

- ELI-NP (2018): The Gamma-Beam System (GBS) will yield unique opportunities for nuclear physics, utilising the high-intensity polarised gamma-beam of up to 19 MeV.

Further opens opportunities for a UK lead in detector developments for the ELI-NP GBS, benefitting from the UK detector expertise:

- Advanced charged-particle array for astrophysics, structure and fission.
- Development of gamma-ray detector system(s).
- Beam monitoring and other GBS support.