

In 2021 AANL can participate and perform the following activities:

1. Monte-Carlo simulation studies of calorimeter resolution:

- a) Investigate effect of fractional coverage of block surface by PMT or SiPD on resolution;
- b) Investigate effect of reflector (wrapping) material (Mylar/Teflon/Gore);
- c) Investigation of optimal resolution for different configurations of crystals in the inner and another material in the outer regions, (e.g. scintillating glass). (To determine the optimal number of crystals for the physics performance and lowest possible cost).

2. R&D studies of EIC EmCal, crystals optical properties, EmCal prototyping:

- a) crystals visual inspection & quality assurance (shape, dimensions, cracks, etc.);
- b) transmittance and attenuation length measurements;
- c) light yield measurements. (AANL is developing but does not yet have the needed expertise and technology base. We plan to participate and perform these kinds of measurements as we have done previously using the materials and facilities of JLab and CUA. This assumes that travel to JLab/CUA will be possible in 2021).

3. EmCal Prototype testing:

- a) Participation in “Prototype testing” at JLab Hall D and/or at DESY (if AANL group has travel support);
- b) AANL can provide 10-20 lead glass blocks (reuse TF-1 type blocks from BigCal, each with dimensions of  $4.0 \times 4.0 \times 40.0$  cm<sup>3</sup>) to construct a prototype consisting of 3×3 or 4×4 modules;
- c) Design and prepare setups (2021-2022) to test radiation resistance of calorimeter components and prototypes using 10-75 MeV energy electron and/or 18 MeV proton beams at AANL. As we do not yet have PbWO<sub>4</sub> crystals at AANL, we can start activities using the available lead-glass (PbO) blocks.

4. Prepare the necessary technical base at AANL for the study of crystal properties:

- a) Preparation of a 1000 class (ISO-6) “clean-room”;
- b) Preparation of test-area (test-lab), electronics and DAQ in the advanced detector laboratory;
- c) Selection & procurement of the required equipment to study properties of the crystals.

5. Grants/finance ?

- a) We propose to specifically apply to the State Science Committee for the support of the electronics;
- b) AANL is developing the advanced detector laboratory and the clean room with the electronics and DAQ (for this we should have a detailed list of what equipment is needed along with approximate costs);
- c) AANL will provide travel support to DESY/JLAB for participation in testing.