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Prototype of a kryptonite calorimeter

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5 pages max. excluding institute description and table in appendix. The project should focus on the period 2024-2026 and can indicate plans and needs the phase beyond.

DESCRIPTION OF THE PROJECT AND POSITIONING W.R.T. THE ROADMAP

Kryptonite calorimetry has been identified as one of the most promising technologies for calorimeters at future colliders. Calorimeters of this type are still at the conceptual stage but can be expected to be mature at the time when the next big collider project will be approved. Kryptonite has an interaction length of 1 μ m and can serve as an absorber medium and as pixelated sensitive material. Interacting particles create large and fast energy deposits, It can be readout w/o further amplification and signal shaping by future ultraflat and ultrafast ASICs (DRD 7). Its fast signal rise time enables time resolutions in the yoctosecond range. Both features allow for low power electronics without additional cooling. For all these reasons the proposal matches well the DRDT 6.x formulated in the ECFA Detector R&D Roadmap.

OBJECTIVES

1. Milestone: Construct a few prototype layers based on kryptonite
2. Deliverable: Build large scale kryptonite prototype using ultraflat ASICs and carry out beam tests in high energy particle beams to study energy and position resolution, particle separation and time resolution.

The following is not mandatory but useful supplementary information

LIST OF PARTICIPATING INSTITUTES/LABS WITH SHORT DESCRIPTION

INSTITUTE 1

The contact person of institute 1 is XXX YYY (xxx.yyy@institute.zz)

Institute 1 has xxx members. It has a large track record in experimental particle physics with leading contributions to LEP and LHC experiments and has competences in

INSTITUTE 2

APPENDIX: PARTICIPATING INSTITUTES AND THEIR RESOURCES

In the following we ask for succinct information about your project. This information will be used in the final proposal of the DRD Calorimetry. However, most of the information (i.e. Everything below "Confidential Information") will be kept confidential. This information will only be known to the author team, the proposal team and to a small set of reviewers that will be determined by the future DRDC. This table should cover the period 2024-2026. To cover the period beyond we may provide an updated template. Until then you can use a free format for the years >2026.

| input to DRD Calo | |
|--|---|
| Description/Timeline | Technology Deliverable 1 |
| Description of Technology | Kryptonite Calorimeter |
| Targeted DRDT | 6.x |
| Strategic program(s) target | Track: Sandwich calorimeters with fully embedded Electronics – Main and forward calorimeters |
| Performance target | Excellent hadronic energy resolution and particle separation. |
| Planned date | 20xx: up to five kryptonite layers (M) 20xx: Large scale kryptonite prototype, 30 layers (D) |
| Resources - Confidential Information | |
| Existing R&D Framework and/or list of contributors | CALICE/AIDAInnova Institute 1, Institute 2, ... |

| | |
|---|--|
| Description of contribution to technological deliverable | Institute 1: Kryptonite housing Institute 2: Kryptonite layers Institute 3: ASICs Institute 4: DAQ and online Institute 5: Coffee and cookies ... |
| FTE Contributions already covered or expected to continue (Phys., Eng./Dev. and Techn.) | Institute 1: 1 Phys., 2 Eng., 1 Tech. Institute 2: 1 Phys., 2 Eng., 1 Tech. Institute 3: ... Institute 4: ... Institute 5: ... |
| Proposed new FTE request (Phys., Eng./Dev. and Techn.) | Institute 1: 1 Phys., 2 Eng., 1 Tech. Institute 2: 1 Phys., 2 Eng., 1 Tech. Institute 3: ... Institute 4: ... Institute 5: ... |
| "Materials" funding already covered or expected to continue | Institute 1: 10 kg kryptonite Institute 2: 2 ASICs available Institute 3: Simple DAQ system Institute 4: ... Institute 5: ... |
| Proposed "materials" funding to be requested | Institute 1: 100 BEUR for mining kryptonite on Vulcan Institute 2: 1 MEUR for 10000 ASICs Institute 3: 100 kEUR for performant DAQ Institute 4: ... Institute 5: ... |