DELight P3: Low-background environment

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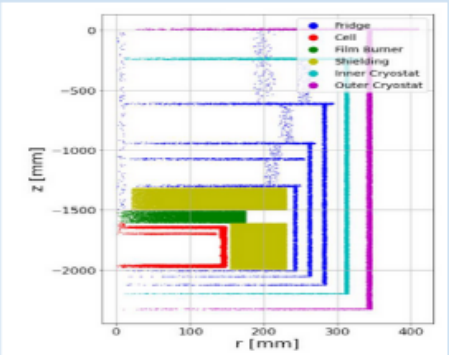
P3 Scope in RU Proposal

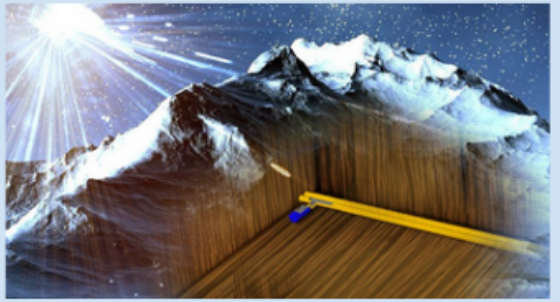
DELight

Project Objectives

P3.1 Detector model

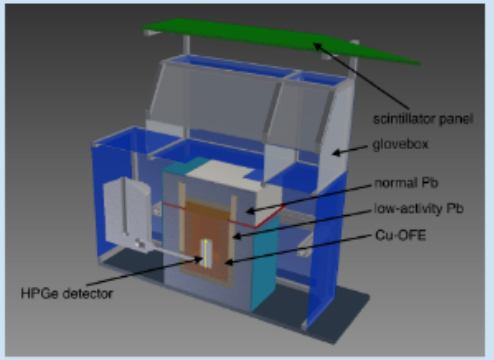


P3.2 Depth requirements



P3.3 Shield, μ-veto?

P3.4 Low-background materials



P3 Evaluation: First paragraph

"This is a **high-quality project** that aims to ensure the required background suppression for phase 1 of the experiment while also containing a **significant component of development** to enable phase 2.

One strength apart from the **clear qualification of the applicants**, is that the project can **leverage existing infrastructure** available through the participating institutes (e.g. GeMSE facility, cleanroom, computing cluster).

Another strength is the use of **well-established techniques and tools**, like e.g. the Geant4 simulation toolkit; while the DELight detector will be a unique instrument with its own requirements and challenges, the methods and tools/equipment already exist and the applicants are experienced in their use.

Some **preliminary work** towards the goals of this project P3 has already been done, e.g. an initial simulation study of background rates at different locations, forming a **solid starting point** for the activities in this project.

As a search experiment for dark matter DELight, **work on the low-background aspect is key**. This sub-**project is therefore essential** for the success of the entire project.

And at the end:
The planned budget is fully necessary.
This very good project is recommended for funding.

Applicants

- Have significant expertise
- Internationally recognized experts
- Collaboration UFR+KIT; leveraging on equipment mainly from UFR
- Importantly: access to Vue des Alpes
- and infrastructure available mainly through UFR.
- The applicants are ideally suited to perform this sub-project. They have extensive experience from several other low-background experiments, both when it comes to design and construction, but also simulation using Geant4, and can directly draw on this knowledge for the deliverables of this project. The planned budget is fully necessary.

Hints of Criticism

- One of the key deliverables of this project is to build a **background model** that will set essential parameters for the experiments. **This entails risks that should be addressed in a strategic way to mitigate them**, which would include finding the goals on level of cleanliness, identifying materials and addressing instrumental backgrounds.
- This **very good project** is recommended for funding

Hauptausschuss zu Gesamtprojekt

- Diskrepanzen zwischen den schriftlichen Vorabstellungnahmen und dem Verlauf der Begutachtung gab.
  → I do not recall such discussions on P3
- Es fehle an Riskmanagement und einem ausreichend detaillierten Plan zum Erreichen der technischen Voraussetzungen.
  → should be improved and expanded in P3
  (see „hint of criticism“)
- Auch eine unklar definierte Nachweisgrenze des Experiments wurde als Kritikpunkt genannt
  → expand discussion on impact of background on sensitivity

Risk in RU Presentation

Work Programme

WP Nr.	Work Package (WP)	Year 1				Year 2				Year 3				Year 4				Contributing project(s)					
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	P1	P2	P3	P4	P5	P6
P0.1	Sensitivity paper																						
P3.1	Development of Geant4 detector model																						
P0.2	Procurement of cryostat																						
P3.2	Determination of depth requirements for underground lab																						
P3.3	Design and study of mechanical shield																						
P0.3	Characterization of the DELight detector																						
P0.4	First science run																						
P0.5	Publication of DM results																						
P3.4	Material selection with HPGe and simulation studies																						
P0.6	R&D towards phase-II																						

Potential risks

Commercial components do not meet radioactivity goals

→

Mitigation

Design modifications, additional shielding, custom-built components

My conclusions

- P3 scope is „essential“ („key“) but apparently not very exciting („very good project“)
  - → add novel components (AI etc) to convert „very good“ project to „excellent“?
  - → are „well-established tools and methods“ sufficient?
  - → Make sure to use the relevant buzzwords...
- Group of applicants, expertise and available resources are a clear project strength
- Requested resources were fully supported.
- No particular weakness, criticism in evaluation
  - → expand risk identification, mitigation and management
- Maybe impove overall proposal by „absorbing“ parts of P6 into P3?