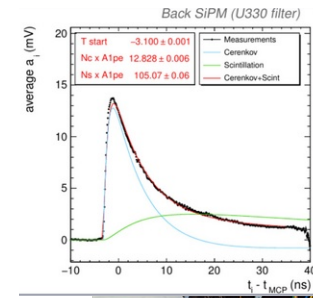
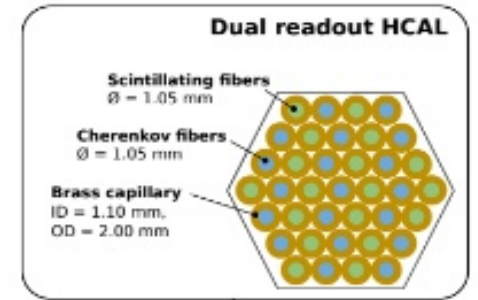
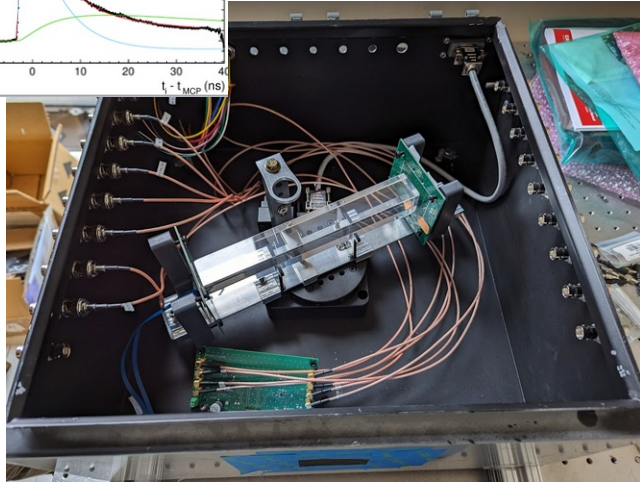
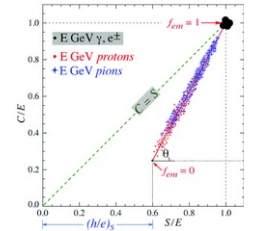
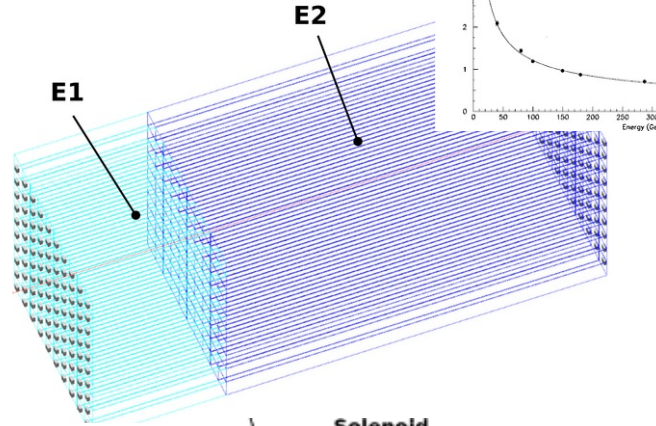


# CalVision: Intro

## Phase 1



## Phase 2



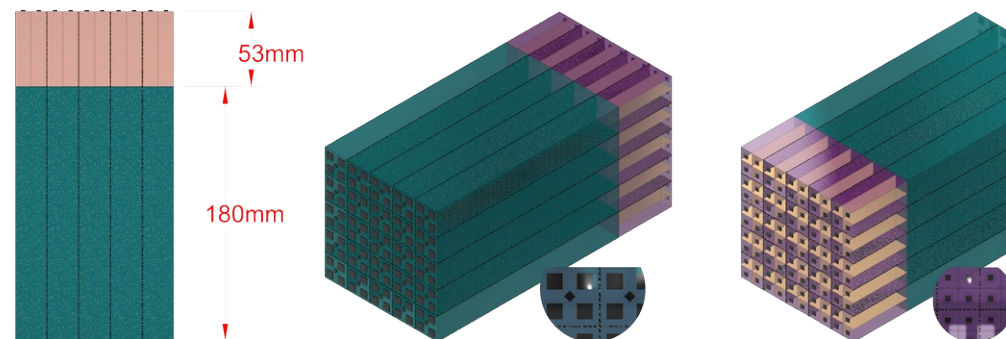
# Recap: Much still remains for phase 1 (before April 2025)

- ▶ **Begin phase 2 with everything in hand to start constructing 5x5 matrix**
  - Crystal purchases and testing
  - Electronics redesigns
  - Mechanical structure
- ▶ Winter test beam
- ▶ Identify items to be purchased at (or before) start of Phase 2 (eg DAQ, calibration HW, SiPMs, other components for matrix)
- ▶ Optical coupling plan for matrix
- ▶ Continue simulation efforts on Test Beam single crystal, EM matrix, hadron layer
  - Effects of gaps between xtals, optimal angles to avoid protective gaps
  - Effect of space between sections
  - Effects of asymmetry is using 2x large + 1x small SiPM instead of 4 for  $\hat{C}/S$  light collection
  - How do FNUF effects change with 2 layers?, ...
- ▶ Fullsim and algorithm improvements
- ▶ Optical photon acceleration via parametrization and GPU/Celeritas
  - n.b. interesting work on medical physics side: See UC Davis talk in [DRD4 meeting tomorrow](#)
- ▶ DESY Test beam paper, others?
- ▶ ...

# Crystal purchase for 5x5 matrix

## Following consensus in last meeting

- 2 layer SCEPCal-based design
- BGO for rear DR section
  - We have shown good S/C separation for this material
  - 180 mm long  $\sim 16 X_0$
  - 22 mm x 22 mm  $\sim 1 R_m$  (25 + 3 spare)
- BGO for front higher granularity section
  - 67 mm long  $\sim 6 X_0$
  - 10.75 mm x 10.75 mm (100 + 10 spare)



22±0.1  
x  
22±0.1

Large cell size =  $\sim 22.3 \times 22.3$   
(tolerance of xtal size +  
carbon fiber srtruct)

Small xtal size = 22.3  
- 0.2 (2x xtal tolerance)  
- 0.6 (6 teflon tape layers)  
/ 2 ( number of xtals / sub array )  
= 10.75 mm x 10.75 mm

## Fully complementary to Marco's matrix

If front crystals are mounted in groups of 4 in the same cell as each large xtal, transverse size is determination by 100um tolerance of crystal + wrapping material

# Upcoming meetings/conferences/deadlines

- Now: (prelim) EOIs for FCC feasibility study. A CalVision entry has been made
- Tomorrow 11 EDT: [DRD4 Collaboration Board Meeting](#)
- 18-22 Nov: [CPAD Workshop](#)
- 30 Oct-1 Nov: [DRD6 Collaboration meeting @ CERN](#)
- 19-20 Dec: [US HFCC detector workshop](#)
- 13-17 Jan: FCC physics week @ CERN. US participation strongly encouraged.
- Jan: FNAL test beam request (single xtal), maybe delay to June
- ~31 Jan: Full EOIs for FCC feasibility due
- 17-21 Feb: [Vienna Conference](#). Abstracts closed.
- 16-21 Mar: Giant [APS Meeting](#) in Anaheim
- 31-Mar: US input to EU strategy process is due
- ~Sept: CERN Test beam request
- Later fall test beam request for FNAL?

# Suggestions for talks in future meetings

Not an exclusive list, but some targets to keep the agendas fresh. Dates are flexible. Let's discuss.

## For November-18

- Status reports: Simulation (TB,full,Celeritas), TB analysis/prep, Fiber HCAL, MaxiCC news
- Preview of CPAD presentation
- Discussion of next test beam (DESY) paper
- Description of crystal test procedure

## For December-16

- Status reports: Simulation (TB,full,Celeritas), TB analysis/prep, Fiber HCAL, MaxiCC news
- More detailed test beam prep / electronics / DAQ/ run plan discussion
- Update on smart electronics studies

## For January-20

- Status reports: Simulation (TB,full,Celeritas), TB analysis/prep, Fiber HCAL, MaxiCC news
- Intermediate report on new crystals (if they had arrived)
- Algorithm studies update
- Thoughts on calibrations for matrix (and beyond?) - maybe move to Feb

# Discussion/Comments



# Additional slides



# Subdetector EOIs

From: Felix Sefkow <felix.sefkowticern.ch>  
Sent: Friday, October 11, 2024 10:14  
Subject: Call for Expressions of Interest to work on detectors for the FCC

Dear FCC Colleagues,

The Physics Experiments and Detector pillar of the FCC feasibility study invites Expressions of Interest by institutes or groups of institutes to work on the development of sub-detector systems and full-detector concepts for FCC, to support and extend the technological developments pursued in the newly created DRD collaborations. The intent of this exercise is to bring people with common interest together, to highlight opportunities and also to showcase the breadth of international interests and technological capabilities to the ongoing European Strategy Update (ESU); no commitments are requested. For reference or inclusion in a planned combined FCC PED submission to the ESU, we would like to have short documents submitted by end of January 2025.

Two separate calls for the EOI, one for sub-detector systems and another for full-detector concepts are being issued and can be found attached.

In order to facilitate the organisation of efforts, we have prepared a Google sheet – accessible at <https://docs.google.com/spreadsheets/d/1P36xEBj121DKDokJfBZKt1p322U2CIPaottQiBFISSA/edit?gid=0#gid=0>

listing groups intending to prepare or contribute to an Eoi, such that interested parties working on related topics can get in touch with each other. Entries in that list can be created via a web form <https://docs.google.com/forms/d/e/1FAIpQLScLHtwbNSoFFia57zR-AxjpY62yOndYFUmvRIsHuQap3gbH5Q/viewform>

We ask you to reflect your institutional interest in the Google Sheet as soon as possible, ideally by end-October. This would allow for identifying institutes with common interests and facilitating collaboration towards common EOIs. The groups would then work together with the intent of presenting the proposed EOIs during the FCC-PED workshop at CERN in January.

For more details, please find the attached Calls.  
Please feel free to forward this invitation to other possibly interested parties.

Looking forward to your responses,  
P. Janot and C. Grojean for the FCC Physics Experiments and Detectors  
M. Dam, M.-A. Pleier and F. Sefkow for the FCC Detector Concepts



# Subdetector EOs

The Physics Experiments and Detectors (PED) Pillar of the Future Circular Collider (FCC) Study invites Expressions of Interest (EOI) by institutes or consortia of institutes to pursue the development of sub-detector (e.g. calorimeter, tracker) designs for FCC experiments. EOIs for work towards integrated full detector concepts are being invited in a separate call.

With this we encourage the federation of international efforts focussing on one or more technologies for a given sub-detector. These activities are expected to be well connected to technological R&D pursued in the framework of the CERN-anchored DRD collaborations and complement these with a focus on system integration aspects at the level of the sub-detector as well as its integration into one or several overall detector concepts. They should support the R&D with simulation and optimisation of system performance and, together with detector concept groups, provide guidance to the R&D via feedback on system design and performance.

We welcome EOIs both on technologies already under study by existing detector concept groups as well as new ideas still to be evolved towards embedded systems. Such new technology approaches should be motivated with reference to performance requirements as well as technological considerations.

EOIs should be compact documents (2-4 pages) including

- The scope of planned activities for the next 3-5 years
- The Partners (Institutes) and their expertise
- The names of one or two contact persons
- The connection with technological activities in the DRD framework
- The engineering and simulation connections with concept groups
- References to relevant more detailed documentation of the technologies

We plan to prepare a document combining the EOIs received in response to this call for a submission to the ESU process, together with an executive summary. Groups may choose to submit their EOIs independently as stand-alone contribution in addition to, or instead of inclusion in the combined PED submission. For inclusion in combined submission, or for reference in the summary, we are asking to send them in final or close-to-final form by end of January 2025.

# High level goals

## Phase 1 proof of principle:

- Identification of sufficient # of C photons for DR in crystal (150--300 photons/GeV for cookie/grease coupling). [First demonstration!](#)
  - Shown at CALOR 2024
  - Proceedings under review for publication
  - Next priority: publish DESY results (will be shown for 1<sup>st</sup> time at CPAD)

## High level goals of phase 2:

- Demonstrate state-of-art ECAL performance in DR matrix w/ SiPM readout. => new ground!
- Demonstrate DR in combined EM+HAD calo with hadron beam. Another 1<sup>st</sup>!
- Demonstration of pointing precision with EM layers
- Demonstration of longitudinal segmentation in HCAL with timing/signal analysis

# Phase 2 goals

## Additional goals

- Study use of novel interfaces for light collection and transmission into sipms\*
- Evaluate new scintillating materials for use in high resolution calorimetry\*
- Integrate fast parameterizations and Celeritas with CalVision DD4HEP model
- Continue to explore timing (also for pointing?)
- 4-D clustering and novel reconstruction, physics performance studies
- Practicalities for a real detector (calibration, readout, conceptual designs for electronics, ...)
- Continue testing/exploring new materials\*
- ....
- Build up the CalVision team, integrate new groups to participate
- Integrate with growing US and international R&D programs / proto-collaborations

\* bluesky in nature and potential for substantial cost savings in a full detector