

# The FOXFIRE liquid xenon R&D project

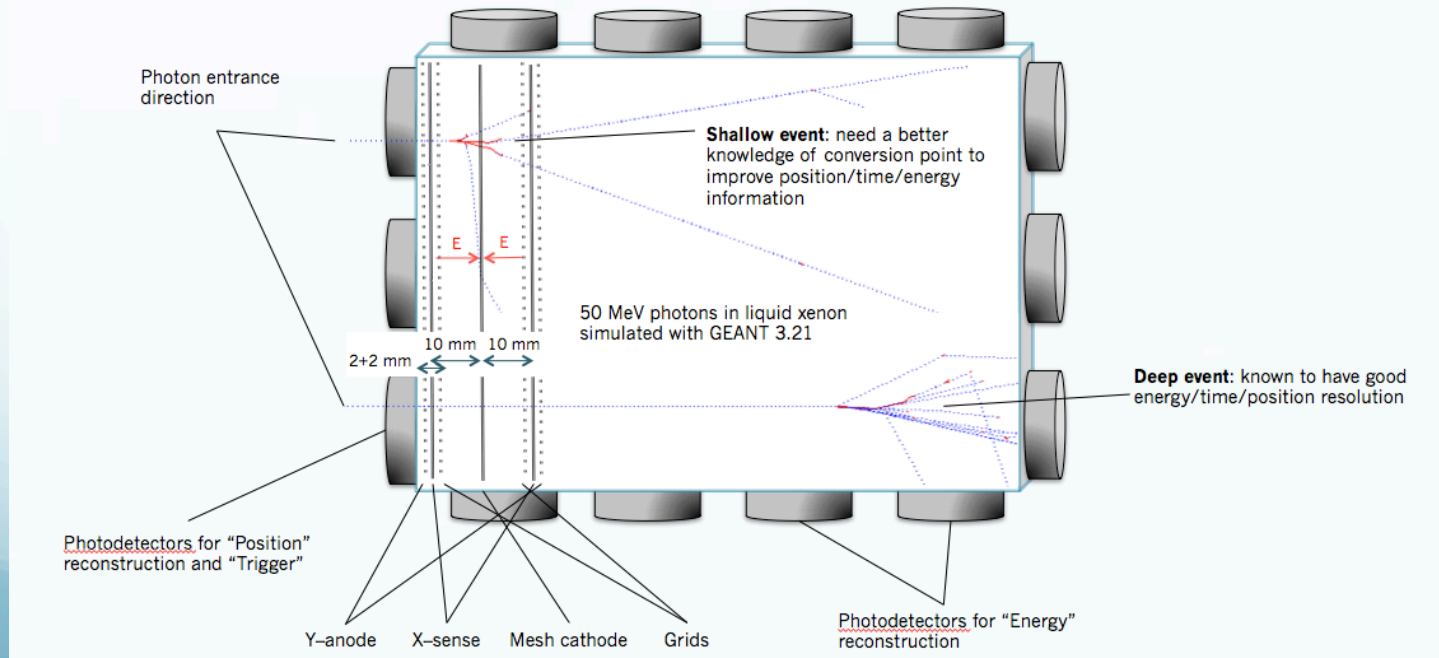
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## Feasibility Of liquid Xenon detector with Frontend for Ionization Real-time Extraction

- Homogeneous liquid xenon calorimeter
- Position reconstruction in the first radiation length by a TPC
- Real-time waveform-digitizing and event topology reconstruction
- Suitable for gamma-rays in the O(100 MeV) range

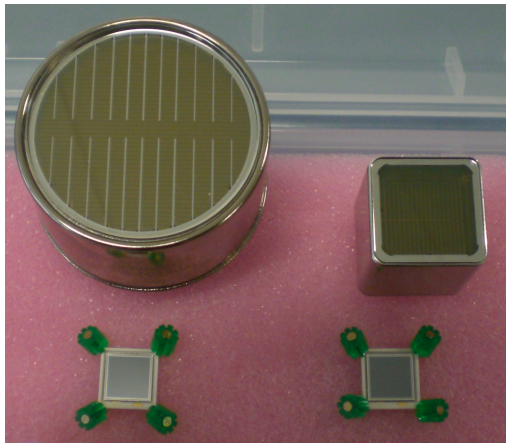


# R&D items

## Photodetectors

Various photo-detector candidates are presently under test for the final prototype.

- Hamamatsu R9869 2" presently used in the MEG experiment (real scale)
- Hamamatsu R8520-406 1" square PMT
- Hamamatsu large VUV sensitive APD's 1cm x 1cm (S8664-1010VUV)
- Possible usage of SiPM for detecting LXe VUV scintillation light with higher granularity.(AdvanSiD 1mm x 1mm, 400 pixel, 50 $\mu$ m)



## Prototype detector

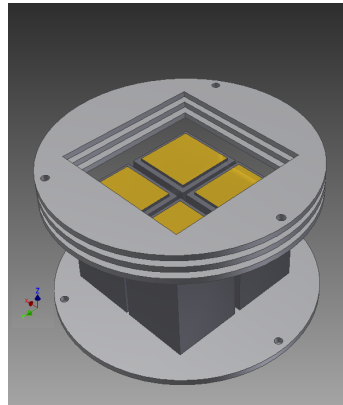
A UHV cold chamber containing 2 litre liquid Xe prototype detector is being instrumented:

- Gas Xe is purified with circulation through a molecular sieve + heated getter
- XY charge readout from 32 + 32 sense wires
- Light read-out and trigger provided by 4 Hamamatsu R8520-406
- Adapted bleeder circuit from MEG R9869 12 stage PMTs: single PMT prototype successfully tested
- Designed the 2x2 PMT support and the wire support (made in CIRLEX™)

Active Volume

Grid & wires  
(not shown)

2x2 PMTs holder



## Online Event reconstruction

Light and charge sampled by custom VME 100 MHz waveform digitizers with complete trigger and read-out.

Customizable design of input stage and firmware:

- Adapt front-end stage to read charge signal
- Flexible memory depth from 1 to 50  $\mu$ s together with the downscale of the 100 MHz sampling in a 1-to-10 ratio can accommodate both light and charge information
- The presence of the FPGA on the board allows for online complex selection algorithms and event reconstruction (energy, time, position)

