Cubism - Braque’s Bottle and Fishes, Paris c.1910–12

ArgonCube

UNIVERSITÄT BERN

AEC ALBERT EINSTEIN CENTER FOR FUNDAMENTAL PHYSICS

LAr Dimensions

DUNE DEEP UNDERGROUND NEUTRINO EXPERIMENT

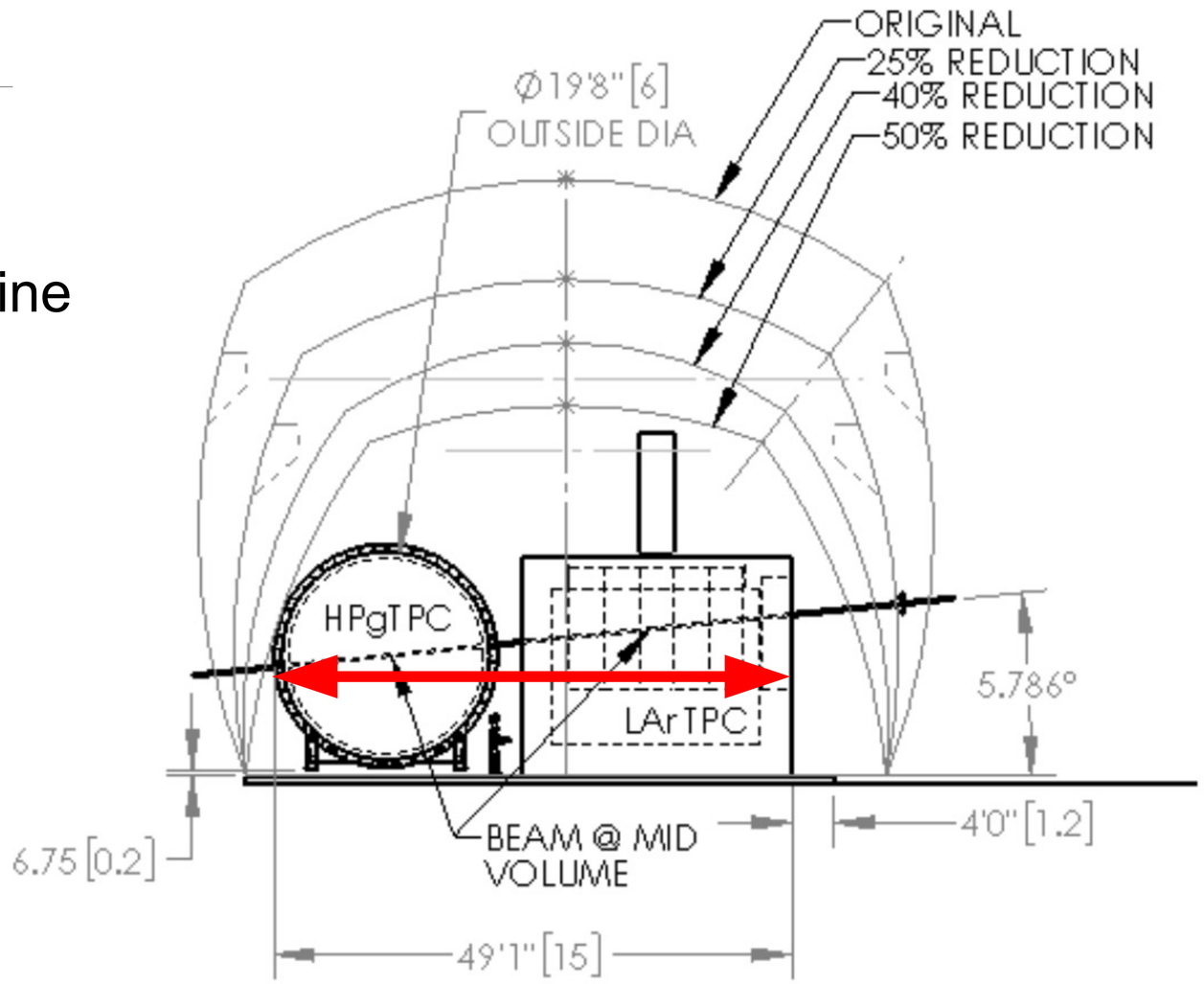
NDDG weekly meeting
Februar 20th 2019
James Sinclair LHEP

A question of length

Forget height limitations.

The ND hall is not long enough for the baseline LAr and GAr detectors to fit on-axis.

The HPgTPC is fixed, so we have to reduce ArgonCube...?!

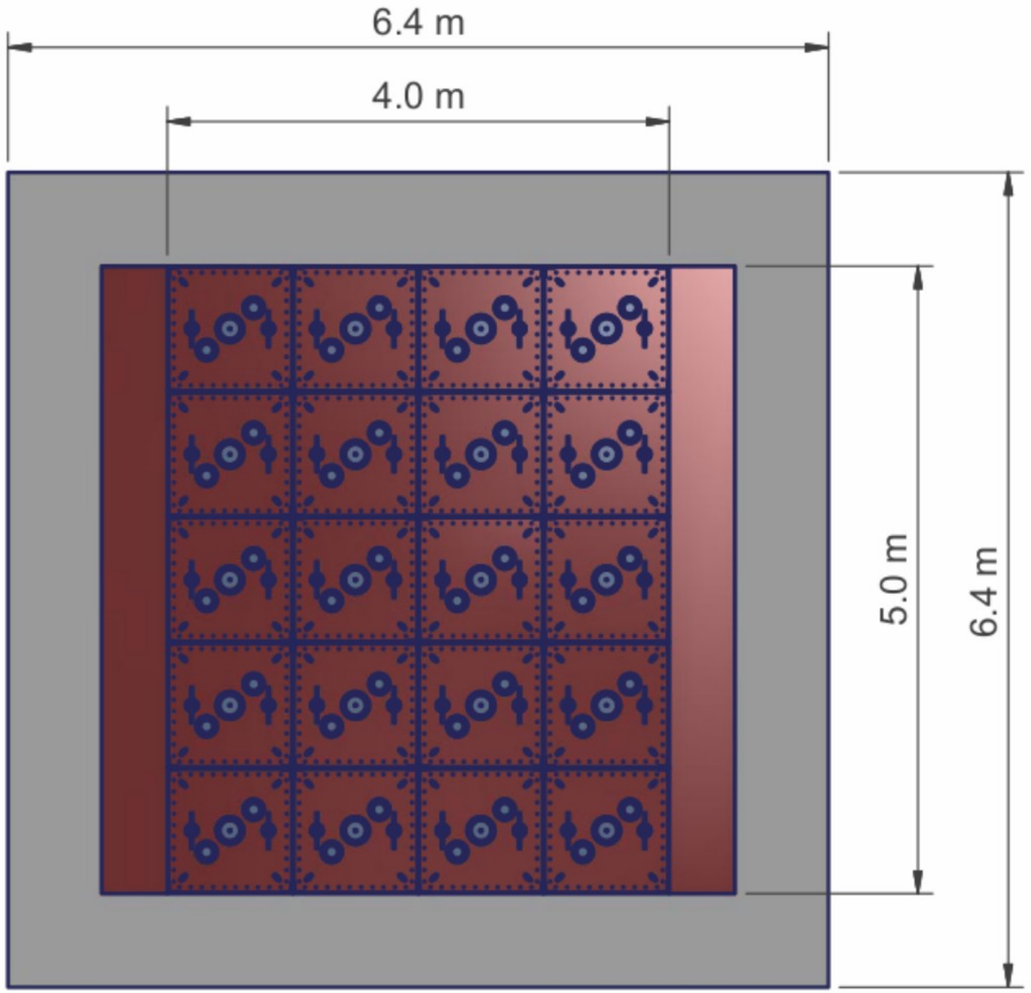


Baseline LAr Dimensions

As of Jan 2018 [DocDB 8184], required active LAr dimensions have been:
5 m in beam x 3 m tall x 4 m wide (width now 7 m for side-going muons)
See Chris' talk

Original cryostat [DocDB 6652] design had:
- Zero clearance volume on-axis
- Concrete support structure
- 0.7 m thickness (1.4 m total)

Total length in beam = 6.4 m



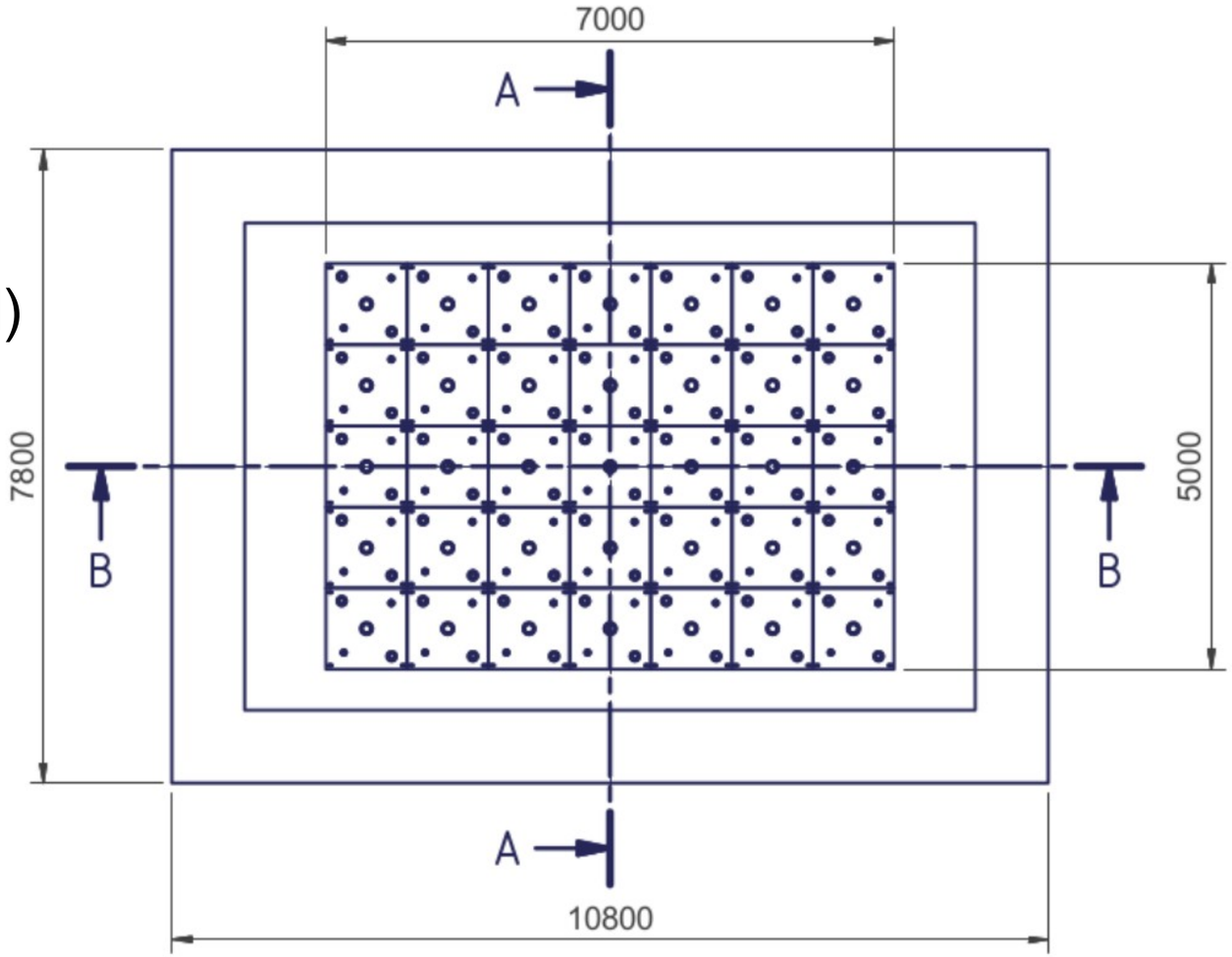
What changed?

DUNE PRISM and therefore the cryostat.

New :
– Clearance volume on-axis 0.5 m (1.0 m total)
– Steel support structure
– 0.9 m thickness (1.8 m total)

N.B. clearance include corrugations in liner (max 0.14 m), so actual clearance is 0.36 m.

Total length in beam = 7.8 m



What can be improved?

Clearance volume should be removed, this is a relic of traditional TPC designs (HV breakdown mitigation).

Support structure and insulation thickness currently based on ProtoDUNE, these require an engineering study to optimise for ND.

Active LAr should not be reduced. See Chris' talk