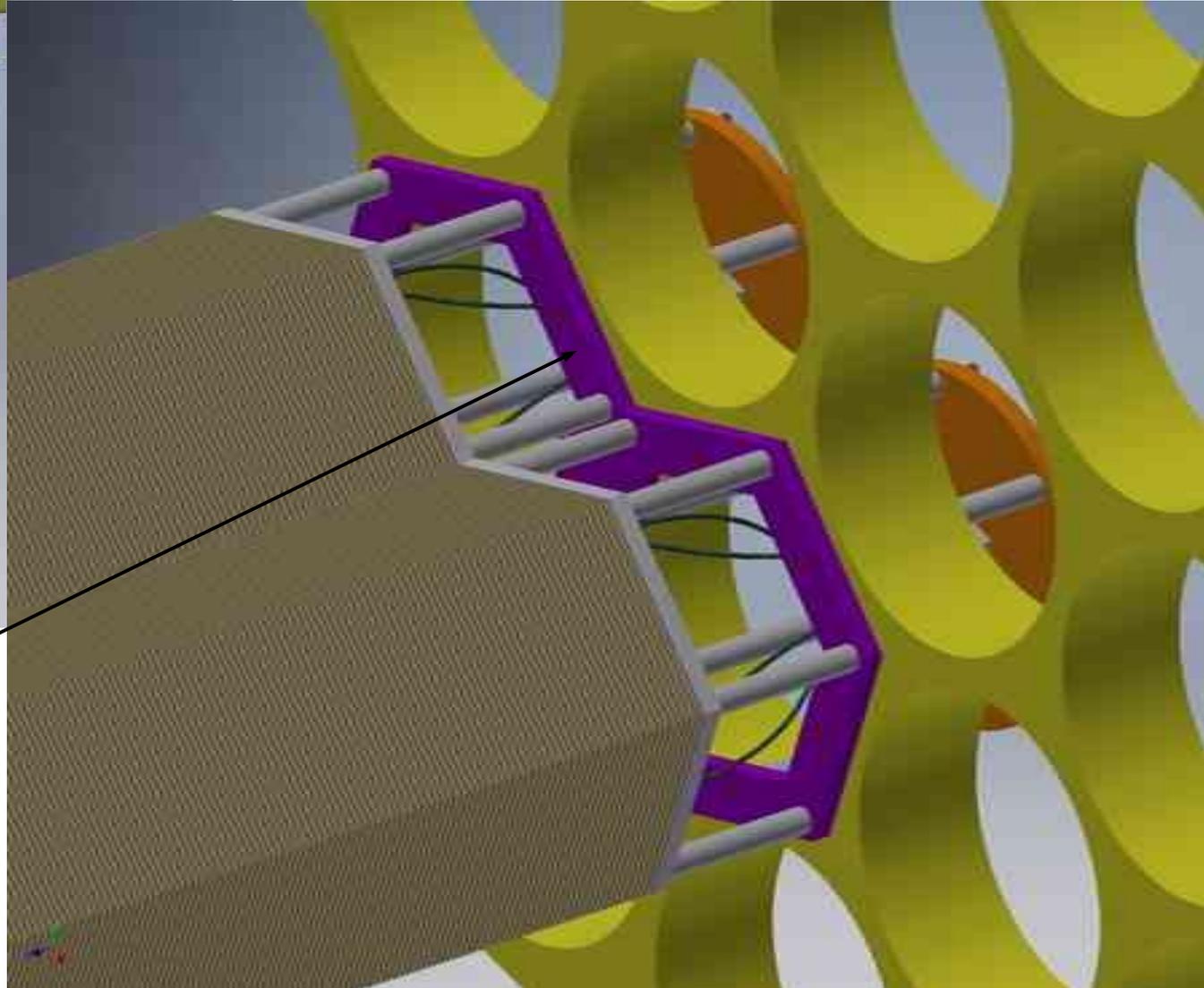
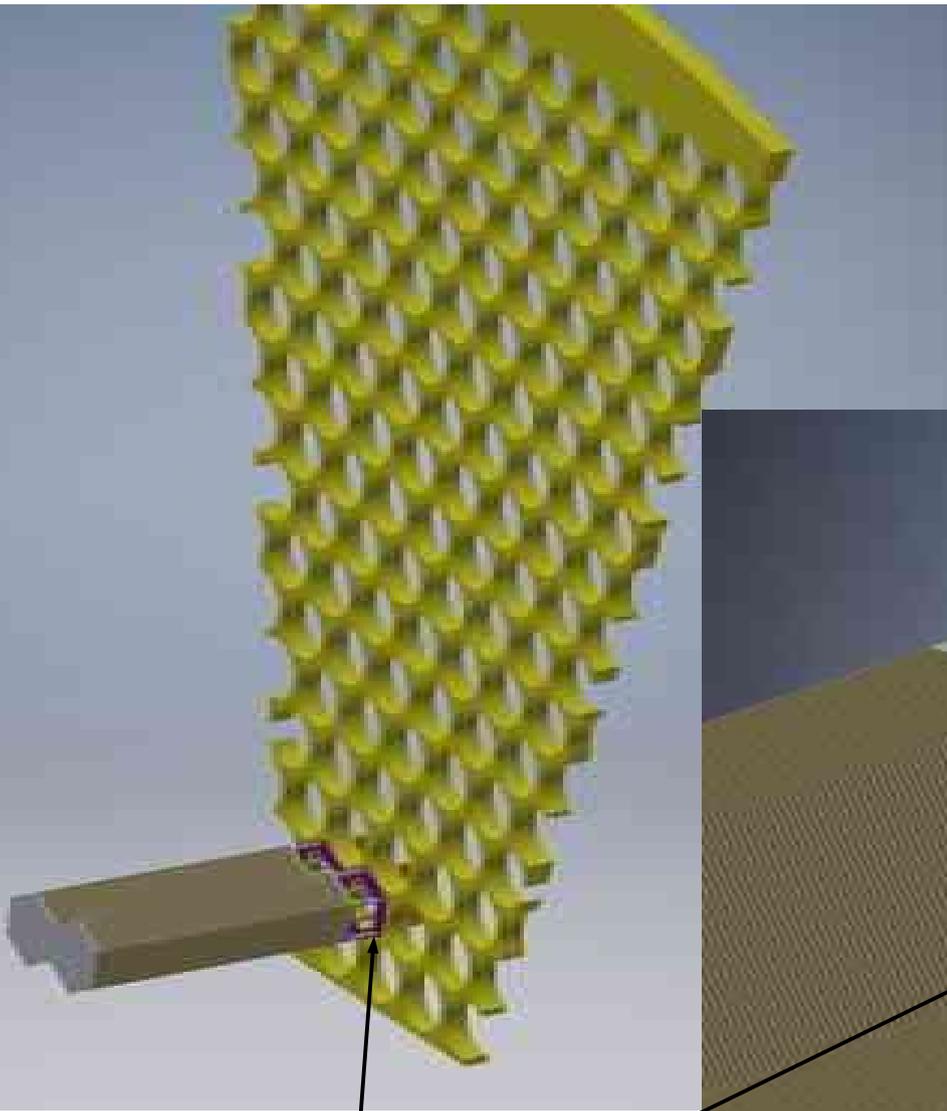


ECal Support Design (cantilevering all shower modules from behind)



need improvement/testing
to minimize module sagging

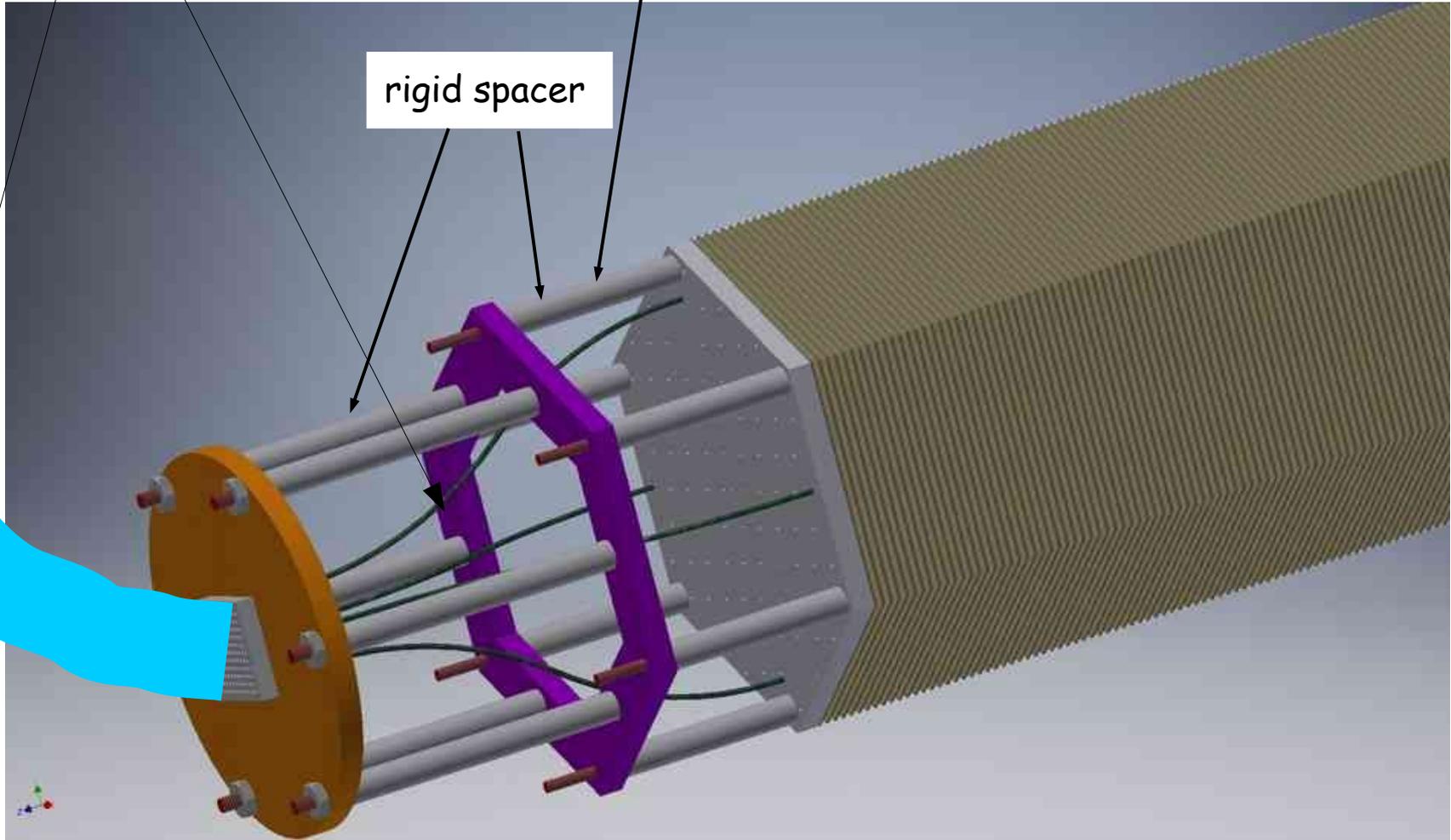
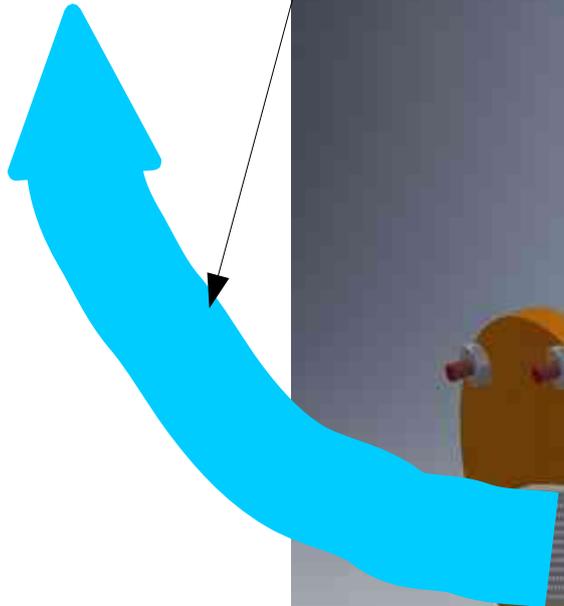
ECal Support Design (viewing from behind shower)

assume 10cm fiber bending radius for both WLS and clear fibers (minimal loss)

clear fiber bundle (1cm dia) guided towards magnet wall

nuts inside hold compression

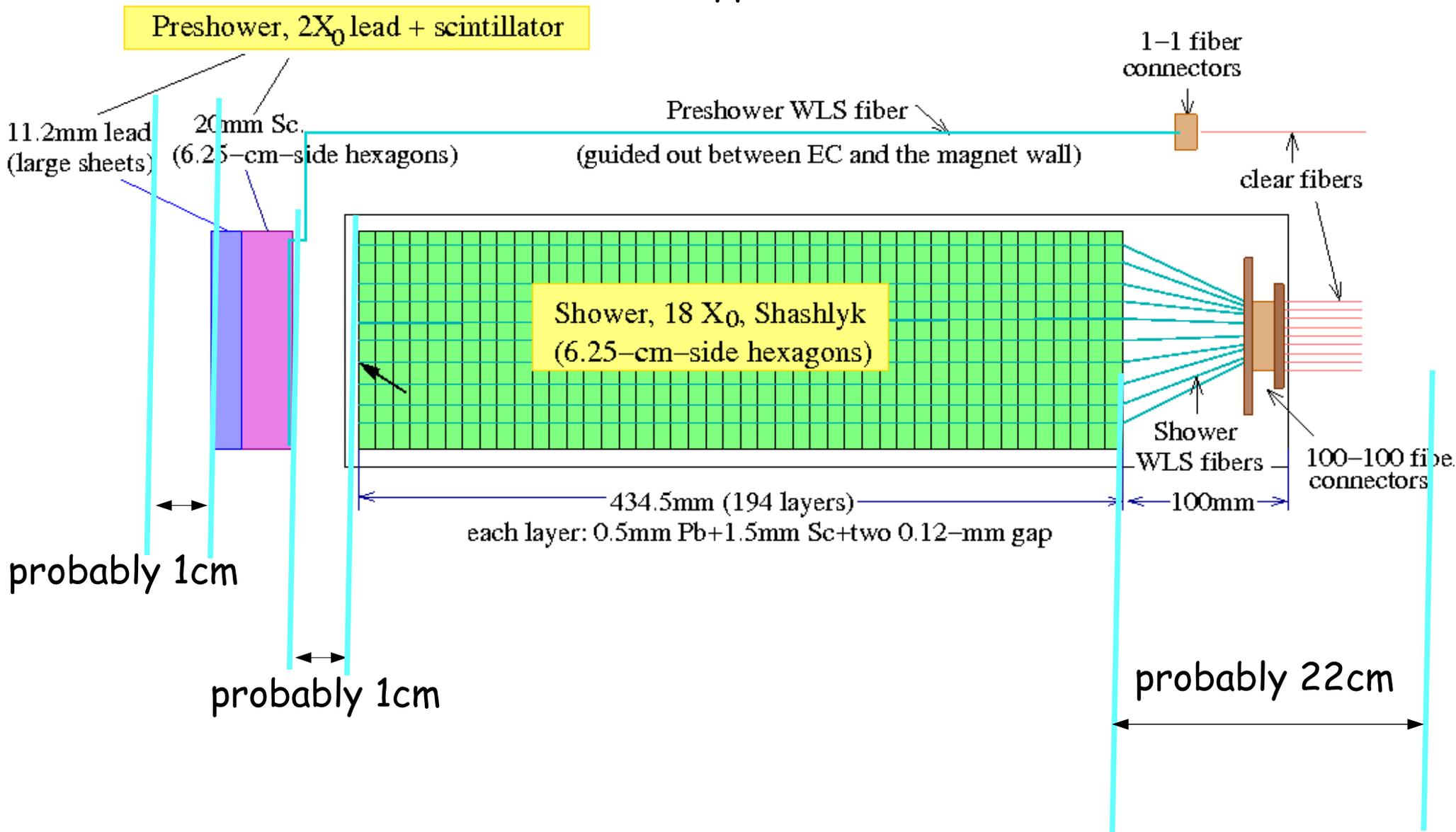
rigid spacer



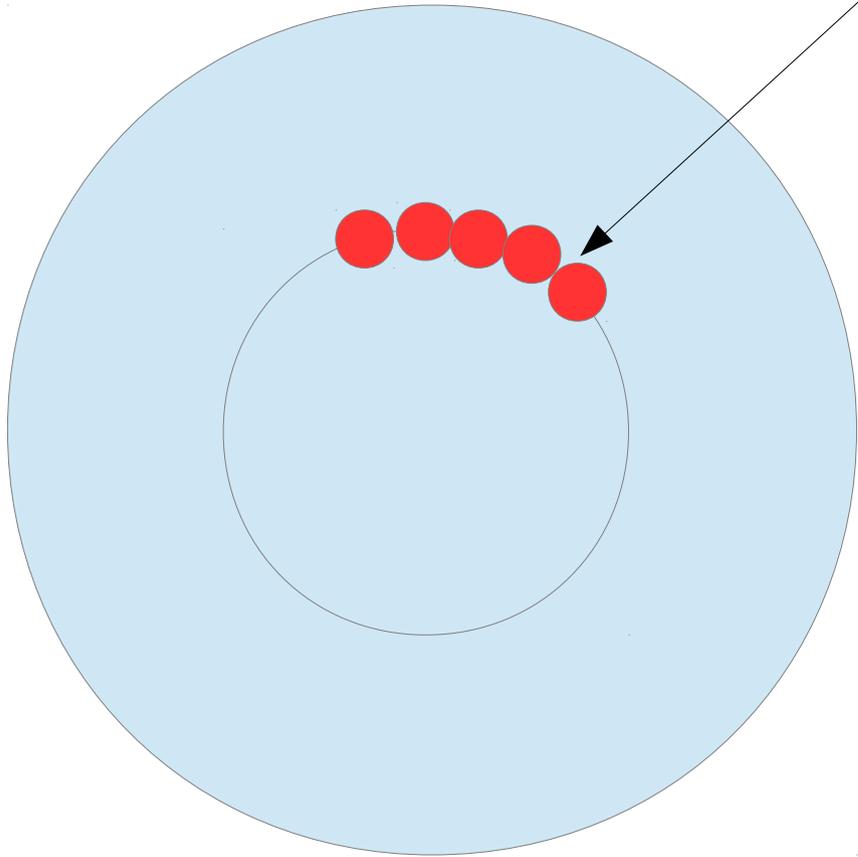
space needed for EMCal total in z: $\sim (74-80)\text{cm}$

ECal overall view:

leave some room in case support is $>10\text{cm}$



Total fiber bundle area (viewing along beam):



number of modules at radius r :

$$N(r) = \frac{2\pi r}{R_m} \quad \text{where } R_m \text{ is module radius, about 10cm}$$

number of modules between radius r_{min} and r :

$$N(r_{min}, r) = \int_{r_{min}}^r N(r) dr \frac{1}{R_m} = \frac{\pi}{R_m^2} (r^2 - r_{min}^2)$$

total "width" of fiber bundle at radius r
(fibers from all modules between r_{min} and r)
needs to be less than $2\pi r$:

$$D_f N(r_{min}, r) < 2\pi r \quad \text{where } D_f \text{ is fiber bundle diameter, } \sim 1.1\text{cm}$$

which requires: for all r

$$\sqrt{r_{min}^2 + \left(\frac{R_m}{D_f}\right)^2} - \frac{R_m}{D_f} < r < \sqrt{r_{min}^2 + \left(\frac{R_m}{D_f}\right)^2} + \frac{R_m}{D_f}$$

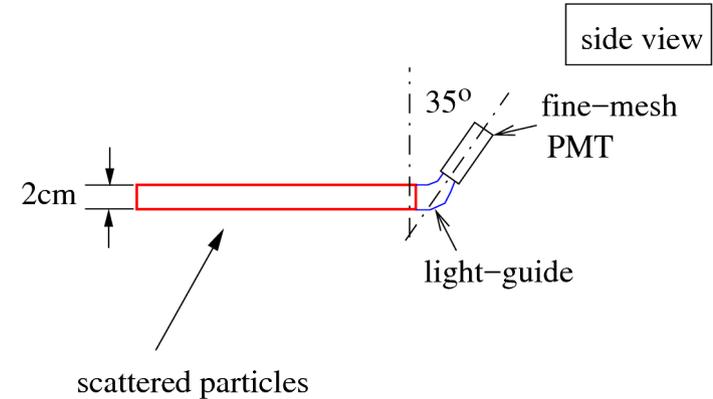
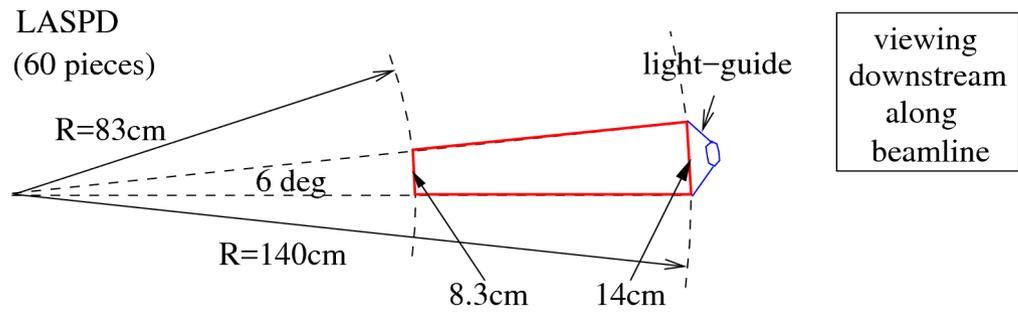
this is $< r_{min} \rightarrow$ no worries

for PVDIS and FA-ECal(SIDIS), needs
two layers \rightarrow bending inner modules'
fiber at 11cm and outer ones at 10cm

LASPD requirement:

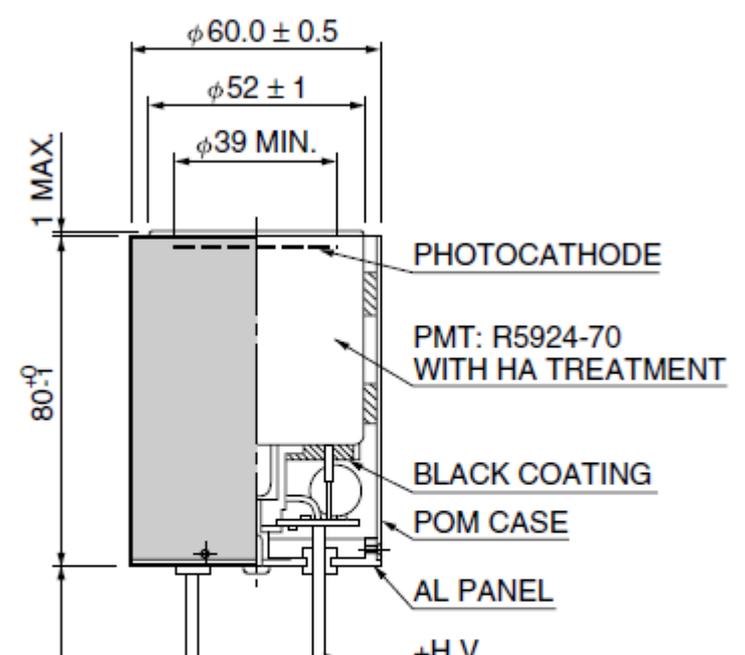
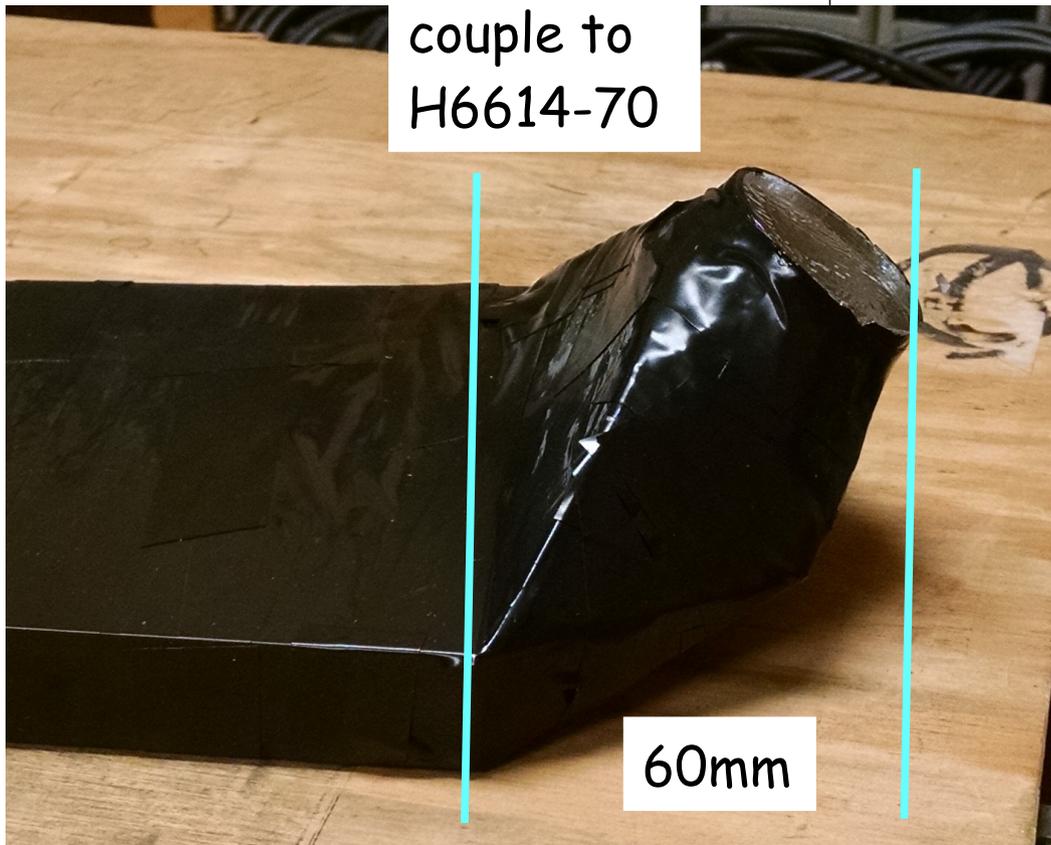
No design for support yet.

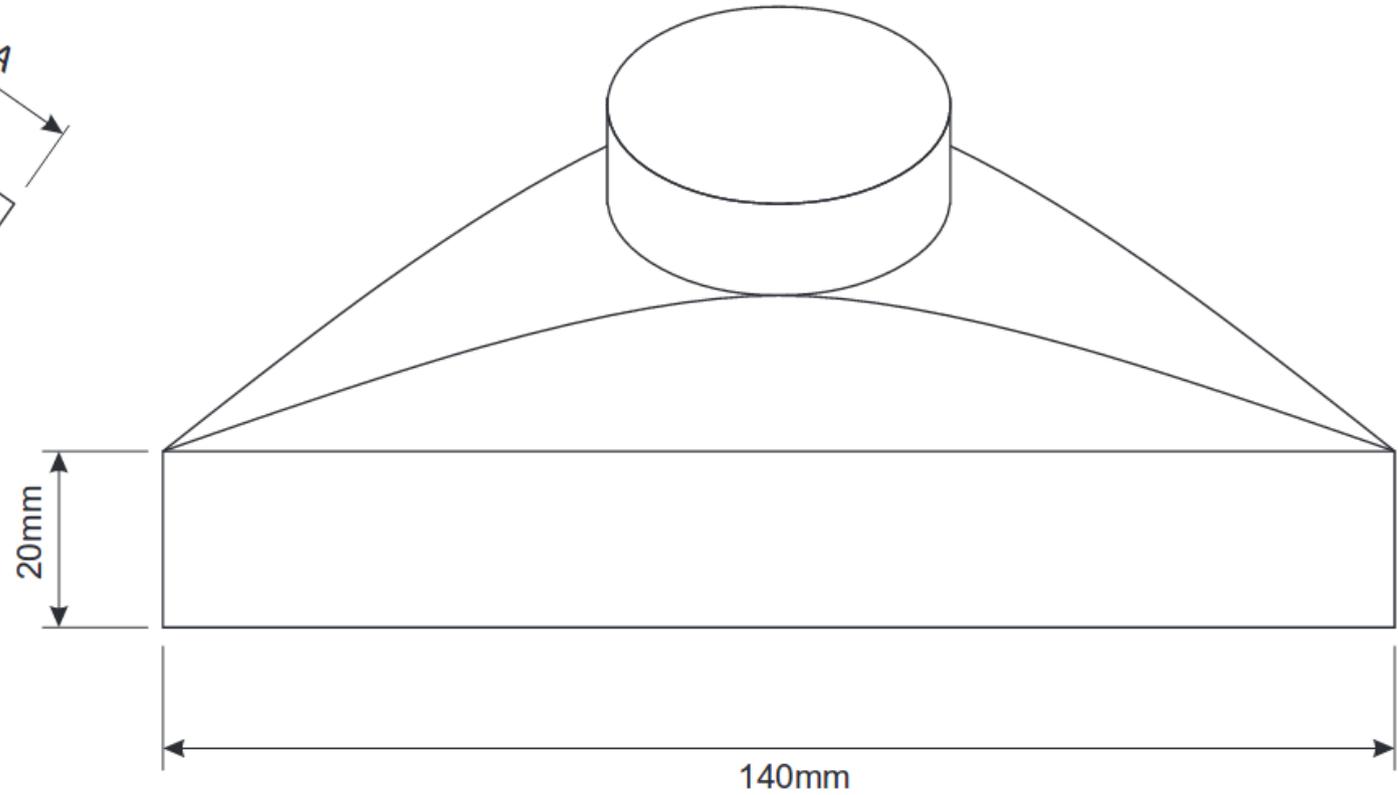
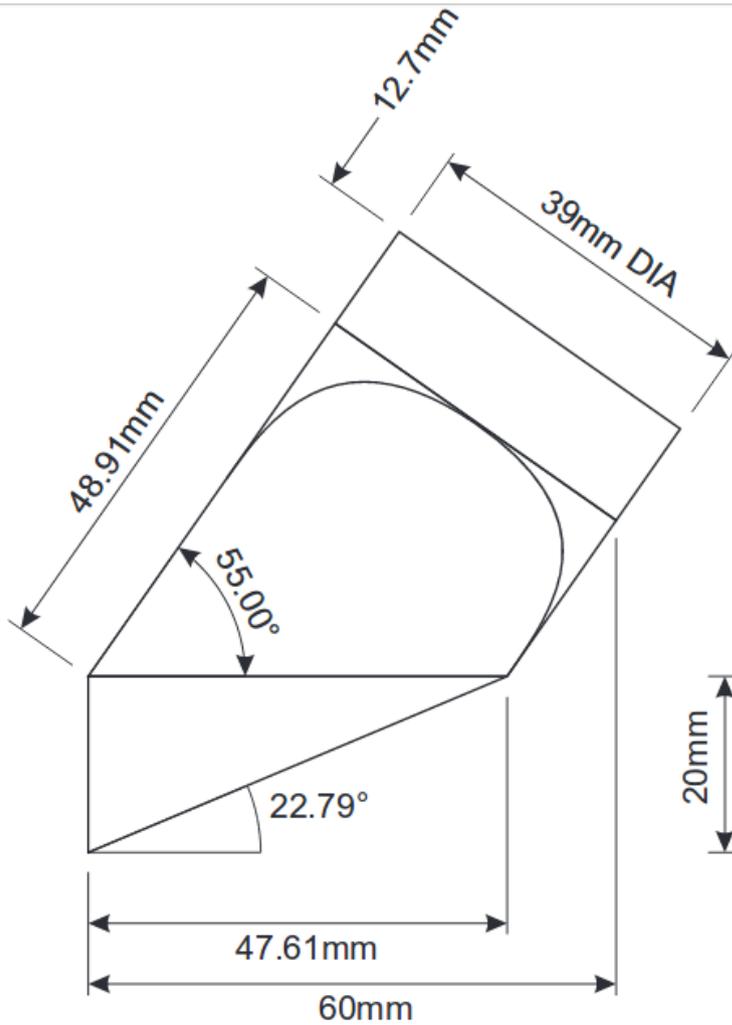
space needed on the outer radial side for the light guide and the PMT:



beamline

21 H6614-70





MATERIAL: ACRYLIC

FINISH: ALL SURFACES
DIAMOND-MILLED
OR POLISHED

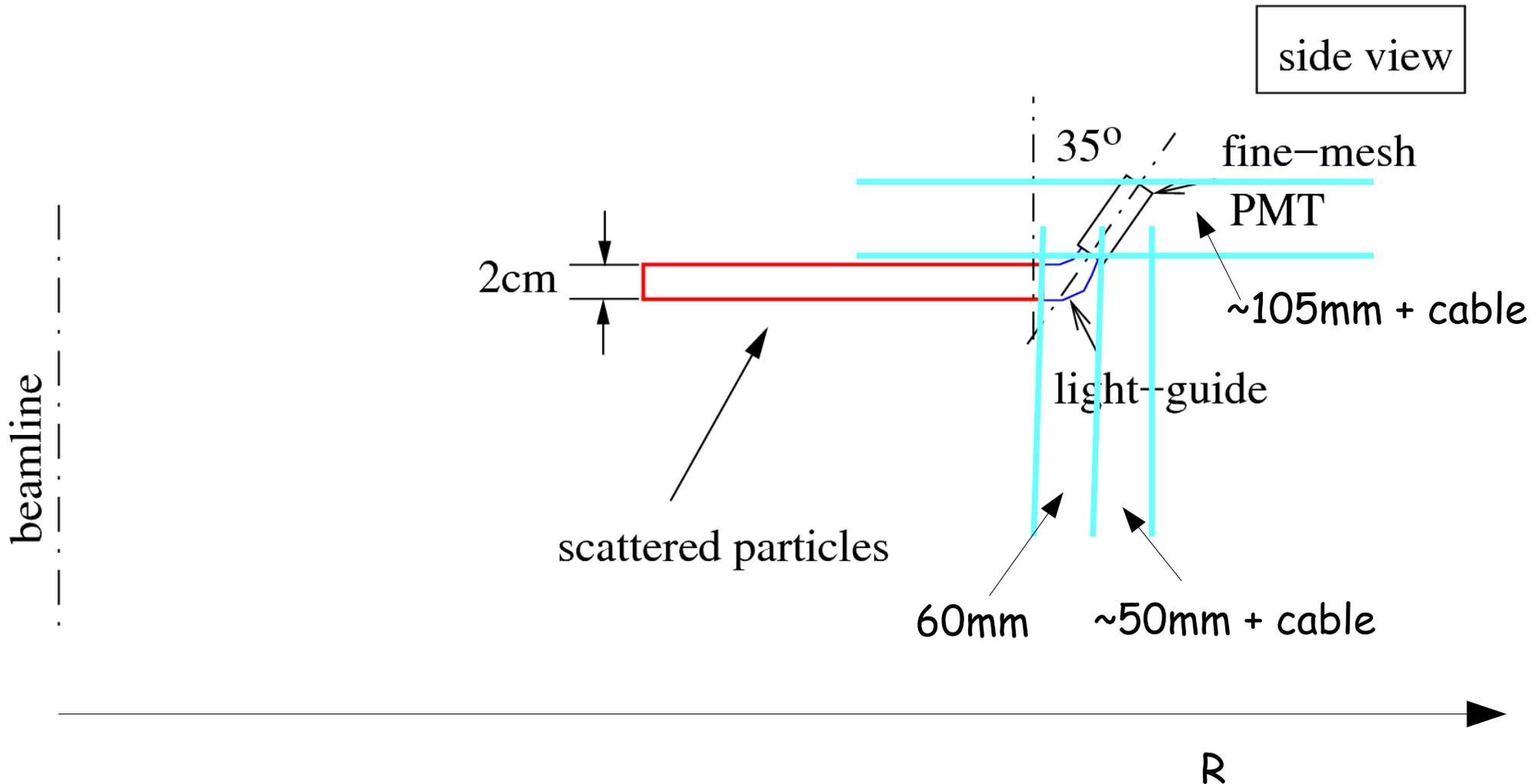
TOLERANCES
.XX ± .010
.XXX ± .005
ANGLES ± 0.5°

ELJEN TECHNOLOGY

LIGHT GUIDE 5
CONCEPT DRAWING

LASPD requirement:

- * for light guide and FMPMT attachment, requires: $\sim 11\text{cm}$ in R on the outer edge, bending either upstream or downstream for $\sim 10.5\text{cm}$ in z .
- * Also needs shielding for FMPMT

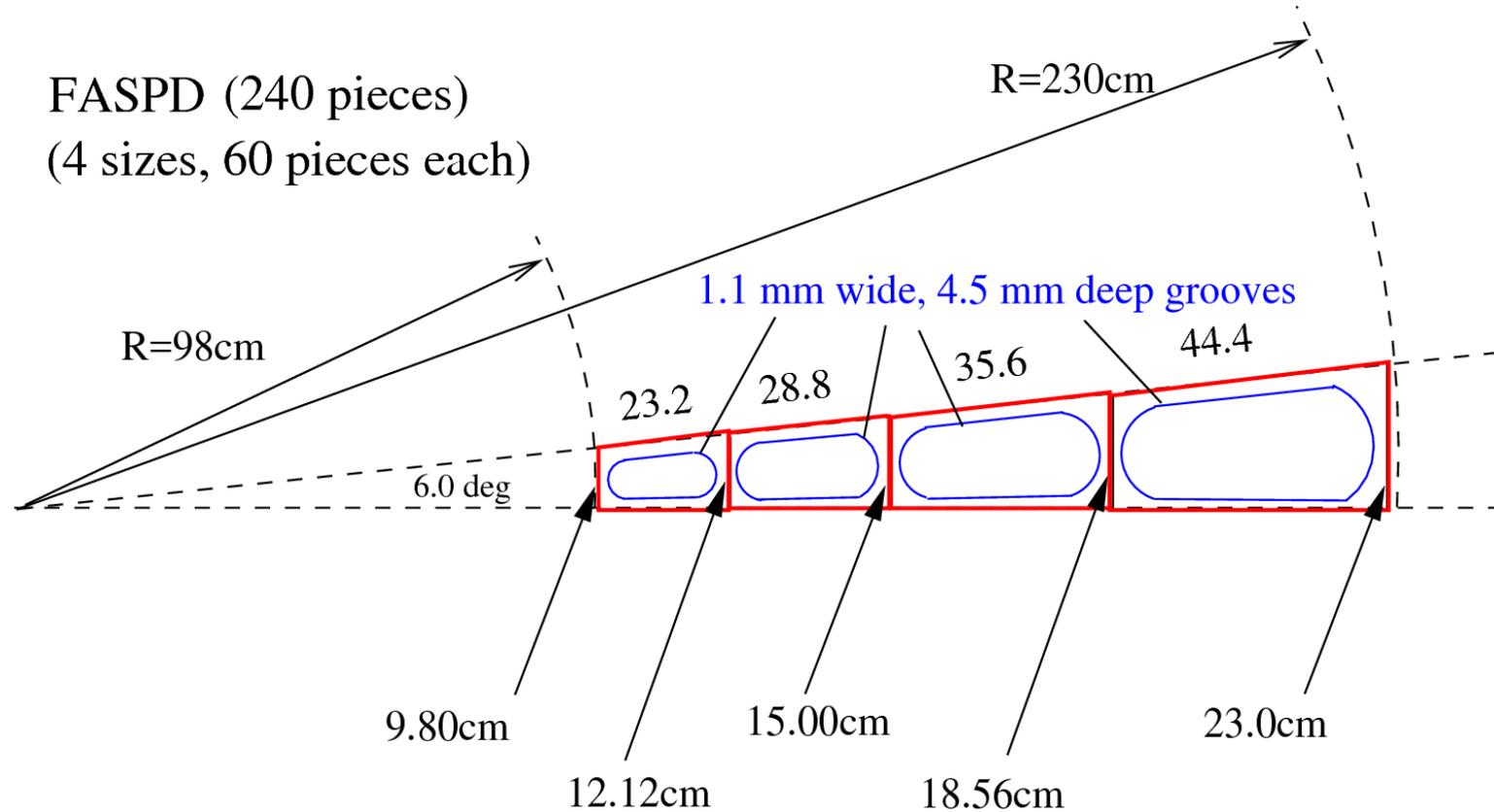


requires: ~1cm behind FASPD for guiding out WLS fibers

FASPD requirement:

No design for support yet, but probably needs only minimal (weight) support.

Behind the modules: 4 fiber ends/module output - minimal space - maybe 1cm in z behind the FASPD will be enough



Total hole area needed:

PVDIS (FA-ECal only):

Shower: 1800x 1.1cm dia clear fiber bundles; (100 fibers/bundle)

Preshower: 1800x ~3mm dia clear fiber bundles; (4 fibers/bundle)

SIDIS:

FA-Shower: 1380x 1.1cm dia clear fiber bundles; (100 fibers/bundle)

FA-Preshower: 1380x ~3mm dia clear fiber bundles; (4 fibers/bundle)

FA-SPD: 240x ~3mm dia clear fiber bundles; (4 fibers/bundle)

LA-Shower: 420x 1.1cm dia clear fiber bundles; (100 fibers/bundle)

LA-Preshower: 420x ~3mm dia clear fiber bundles; (4 fibers/bundle)

LA-SPD: 60x HV + 60x signal cables

all fibers are 1mm dia circular

Total weight:

PVDIS (FA-ECal only):

Shower: 1800 modules at about 15kg/module

Preshower: 1800 modules at about 230g/module

SIDIS:

FA-Shower: 1380 modules at about 15kg/module

FA-Preshower: 1380 modules at about 230g/module

FA-SPD: 240 modules, (4 sizes), total mass about 89kg

LA-Shower: 420 modules at about 15kg/module

LA-Preshower: 420 modules at about 230g/module

LA-SPD: 60 modules at about 1.5kg/module + light guide + fine-mesh PMT

All above not including support structure weight (TBD).