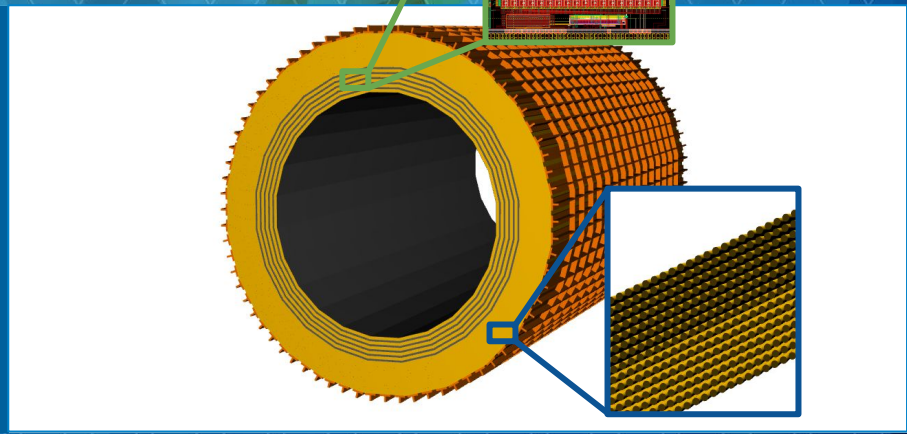
Barrel Imaging Calorimeter Meeting,
September 26, 2023

Barrel Imaging Calorimeter (BIC)
Fiber Decision



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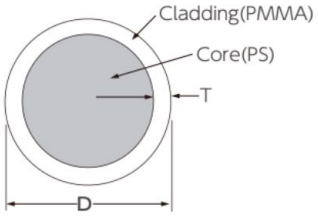
Fiber Specs

bECAL detector

1. Double or Single clad fibers, round cross section
2. diameter 1.0 mm
3. diameter tolerance shall be less than 2%, <20 μm
4. Single clad: cladding thickness ~2% of diameter,
   Double-clad: cladding thickness ~4% of diameter
5. attenuation length for blue light >3.5 m
6. emission spectrum of blue-green light
7. light yield > 7000-8000 ph/MeV
8. scintillation decay time < 3ns
9. delivered in spools or canes
10. total length 4500 km.
11. delivery schedule: ~3 years

Single Cladding



Cladding Thickness[1]: T=2% of D
Numerical Aperture: NA=0.55
Trapping Efficiency : 3.1%

Communicated to Kuraray & Luxium (May 2023); both indicated delivery in ~ 4 yrs (with fECAL 3,000km SciFi)

Long Lead Procurement

Timeline

Decision to be made **before the EIC CD3A OPA review on November 14-16**

- Decision to be made within Barrel Imaging Calorimeter DSC
- Presented at ePIC Calorimetry Meeting
- **Signed Record of Decision**

Bottom line: decision to be made within next 4 weeks

- Fiber light output measurements
- Simulations of 2-side attenuated light response

To be studied in simulations

- Implementation of **realistic attenuation** length in 2-side readout - in progress
- Implementation of **realistic thresholds** per readout cell - implemented

Effect to be studied:

- Impact on e/π separation
- Impact on photon measurements (low threshold)
- Impact on z-position determination in fibers (ToF)
  - light yield per channel along with thresholds may affect ToF particularly at sector ends, when signal on the far side will be significantly attenuated

To be studied in simulations

Impact on energy resolution:

- We don't expect any significant effect on resolution due to increased light yield (with double clad) → it is defined mainly by sampling fluctuations
- But the energy is distributed among many channels with their own noise and threshold, may eventually affect the resolution, particularly for lower energy photons

The negative rapidity end, we have to be capable to measure electrons as well as possible (important kinematical region with intermediate Q2)

- Double clad fibers in imaging layers (?) before shower maximum

Integration

η = -1.77 and +1.31 for those lines assuming *one block size less than maximum radius*