

ePIC barrel and endcap ECal overlapping study

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The UCLA logo consists of the letters "UCLA" in a bold, white, sans-serif font, centered within a solid blue rectangular background.

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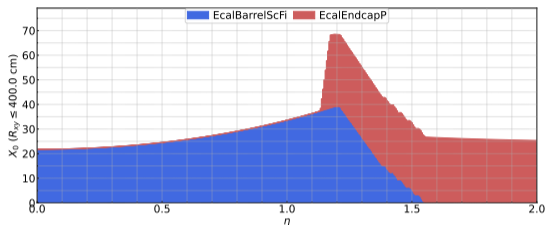
- Previous report based on brycecanyon on May 17, 2023.
- The coverage of barrel ECal in craterlake slightly changed.
- Previously used a slightly larger radius (246 cm, down to $\eta = 1.1$) for fEMCal in brycecanyon.
- This report tested fEMCal radius of 195 and 185 cm.

Component	Configuration	Length	Inner R	Outer R	Start	End
Barrel EMCAL	Brycecanyon	498	79	133	-299	199
	Craterlake	470	81	116	-274	196
Forward EMCAL	Brycecanyon	30	14	195	330	360
	Craterlake	30	14	195	330	360

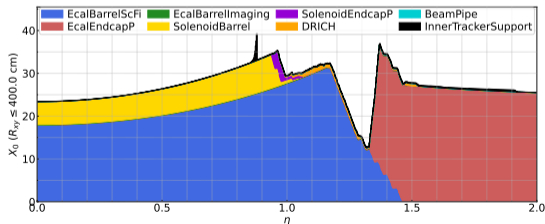
Table from [brycecanyon](#) and [craterlake](#). The previous study in DD4hep and the material scan in brycecanyon used a slightly larger size (246 cm) of fEMCal for checks.

Material scan: brycecanyon vs craterlake

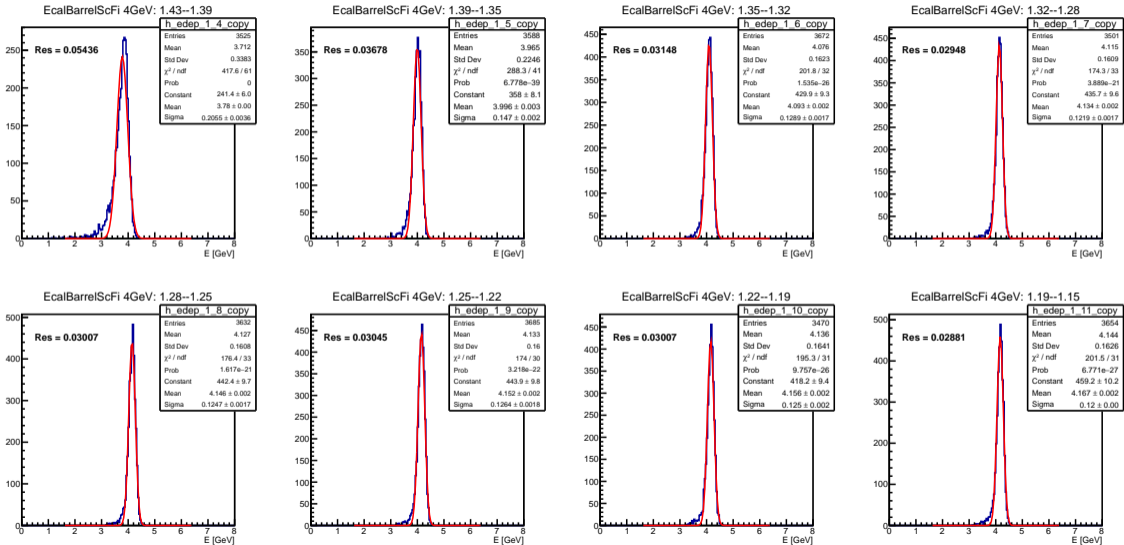
- Brycecanyon
- Barrel coverage slightly over $\eta = 1.5$
- fEMCal downto $\eta = 1.1$ ($R_{outer} = 246$ cm)



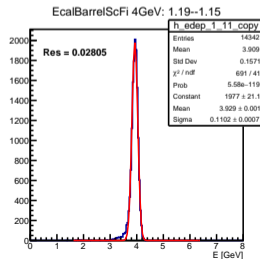
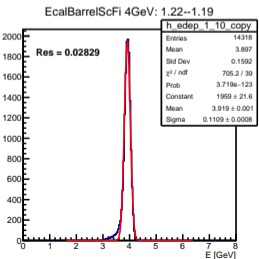
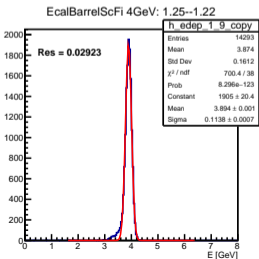
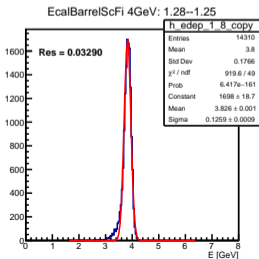
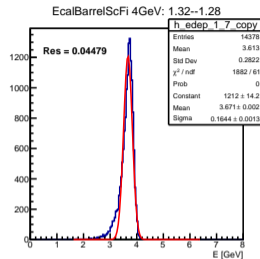
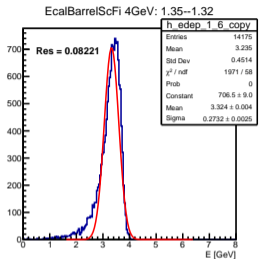
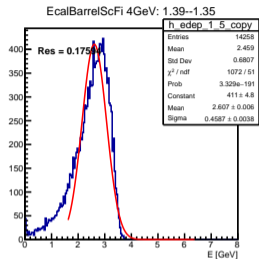
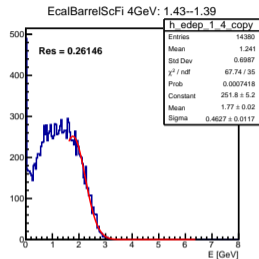
- Craterlake
- Barrel coverage slightly below $\eta = 1.5$
- fEMCal downto $\eta = 1.3$ ($R_{outer} = 195$ cm)

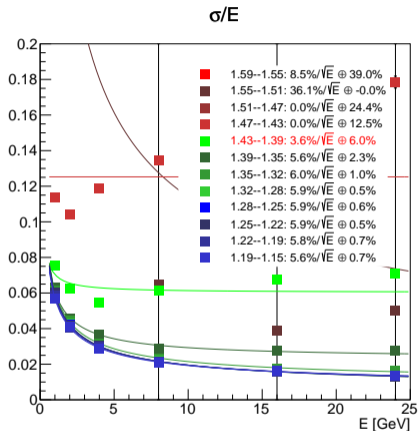


Barrel ECal bad above $\eta = 1.4$ in brycecanyon

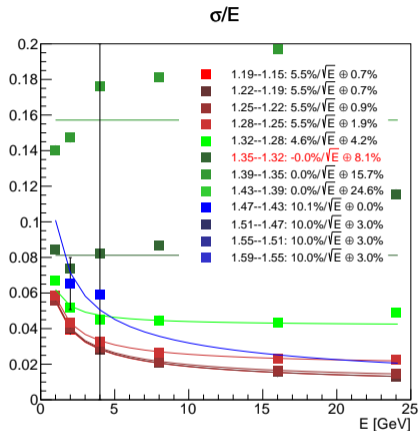


Barrel ECal bad above $\eta = 1.3$ in craterlake





Bryce Canyon: need fEMCal for $\eta > 1.4$

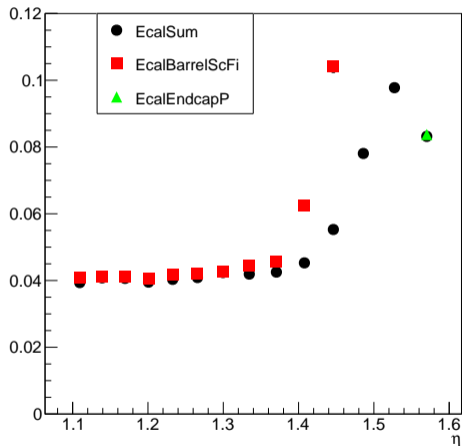


Craterlake: need fEMCal for $\eta > 1.3$

For η larger than the red line, the barrel Ecal does not have good resolutions and we need the fEMCal.

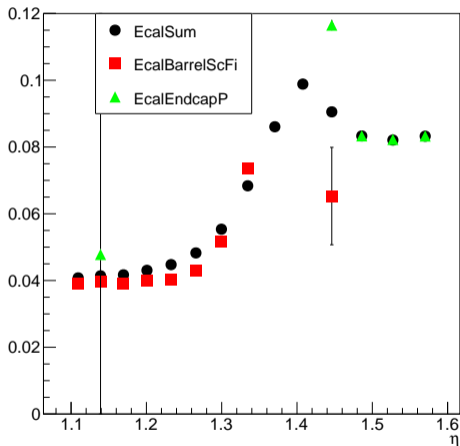
Single photon resolutions vs η at 2 GeV

σ/E at 2 GeV



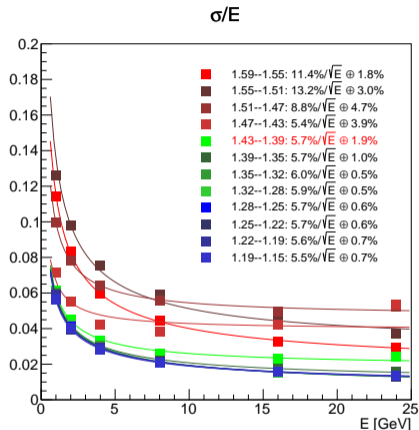
Bryce Canyon: need fEMCal for $\eta > 1.4$

σ/E at 2 GeV

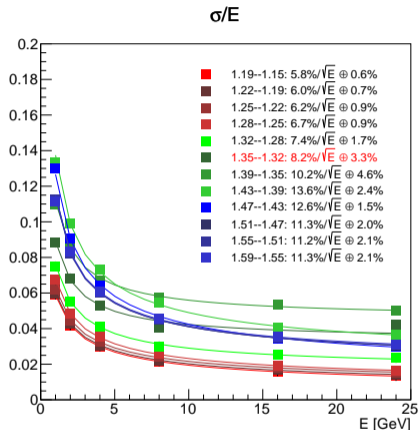


Craterlake: need fEMCal for $\eta > 1.3$

Barrel + endcap ECal resolution



Bryce Canyon: need fEMCal for $\eta > 1.4$



Craterlake: need fEMCal for $\eta > 1.3$

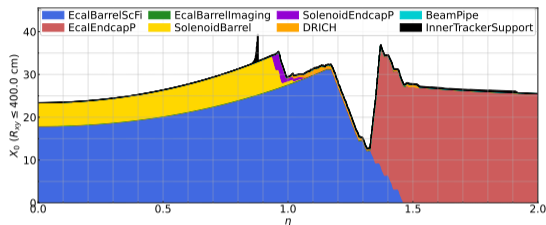
Combined barrel and endcap ECal provides good energy resolution in all η ranges.

Checks for fEMCal with $R_{outer} = 185$ cm

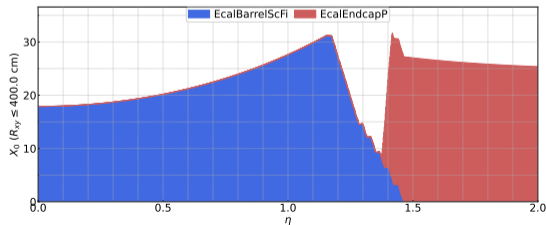
- The previous study used $R_{outer} = 195$ cm for fEMCal in craterlake.
- The following checks use $R_{outer} = 185$ cm for fEMCal in craterlake.

Material scan in craterlake: 195 vs 185 cm

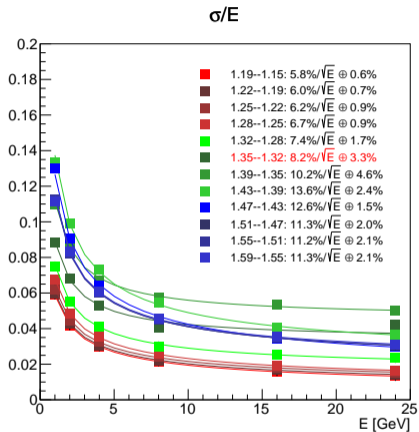
- Craterlake
- fEMCal with $R_{outer} = 195$ cm



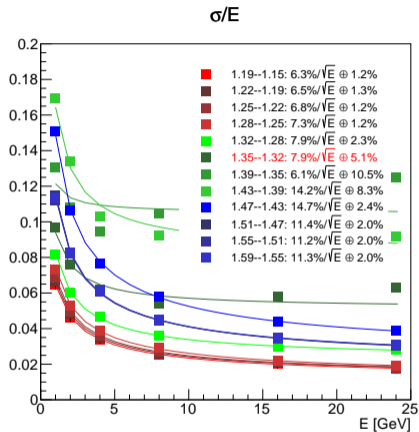
- Craterlake
- fEMCal with $R_{outer} = 185$ cm



Barrel + endcap ECal resolution



Craterlake: fEMCal $R_{outer} = 195$ cm



Craterlake: fEMCal $R_{outer} = 185$ cm

Combined ECal with $R_{outer} = 185$ cm of fEMCal has poor energy resolution in some η ranges.

- Previously in Bryce Canyon, need fEMCal coverage down to $\eta = 1.4$ ($R_{outer} = 173$ cm).
- Currently in Crater Lake, need fEMCal coverage down to $\eta = 1.3$ ($R_{outer} = 195$ cm).
- In current configuration of Crater Lake, fEMCal with $R_{outer} = 185$ cm is not large enough to provide good energy resolution in all η ranges when combined with the barrel ECal.
- If length or radius of barrel Ecal changes again, we need to repeat the same exercise again.