

# Effects of temperature on elastic calibration coefficients

📼 Date	@10/04/2023
	Research
i≡ Tags	Jab_NPS

# **Crystal temperatures on Oct.1-Oct.2**

• Dash line denotes the start time of each run



## Thermal sensor at middle column (front 25-32)



#### Thermal sensor at middle column (back 25-32)

# First 6 runs taken on Oct.1-Oct.2 (run 1549-1554)

9 10 E<sub>e-</sub> [GeV]

# **Electron energy**

#### Energy resolution in the calorimeter Electron energy ×10<sup>3</sup> <u>×10<sup>3</sup></u> Counts Counts 14 E., from proton in HMS Gaussian fit 20Ē ---- Gaussian fit $mean=0.142\pm0.001~GeV$ 12 $mean=7.360\pm0.002~GeV$ $\sigma = 0.223 \pm 0.002 \; GeV$ 18 $\sigma=0.171\pm0.002~GeV$ resolusion = 0.030 10 16Ē E<sub>e</sub> from NPS Gaussian fit $mean=7.481\pm0.002~GeV$ 12È $\sigma = 0.283 \pm 0.002 \; \text{GeV}$ 6 F 4 2 ᇮᡛ 04

Coefficients (zoom in)

2 3 4 5 6

14

10 8

# Coefficients in 2D view (zoom in)

-3 -2

**Energy resolution in NPS** 

2 3 4 E<sub>e-</sub><sup>NPS</sup> - E<sub>e-</sub><sup>p, HMS</sup>



# Last 6 runs taken on Oct.1-Oct.2 (run 1555-1560)

# Electron energy



# **Energy resolution in NPS**



# Coefficients (zoom in)



# Coefficients in 2D view (zoom in)



# Ratio of these coefficients (last 6 runs / first 6 runs)

- The light yield of crystals decrease when the temperature increase
- Higher temperature result in higher coefficients



## Energy with mis-calibration due to the unsteady temperature

- Apply the coefficients from run 1549-1554 to the data of run 1555-1560
- 32% difference of the resolution  $(0.025 \rightarrow 0.033)$
- Under estimation of deposited energy: 7.479 7.205 GeV ( $E_{dep} = C \times Amp$ .)

#### **Electron energy**



# Energy resolution in NPS



# Previous coefficients (with run 1437-1442) are quite uniform, why?



Thermal sensor at middle column (front 25-32)

#### Thermal sensor at middle column (back 25-32)



Coefficients (zoom in)

## Coefficients in 2D view (zoom in)



**Electron energy** 



**Energy resolution in NPS** 

