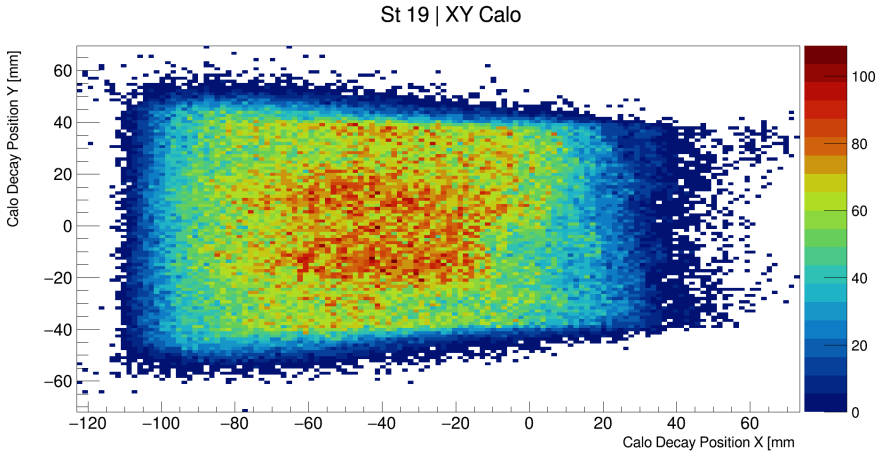
# Independent check of gain corrections based on the E/p ratio III

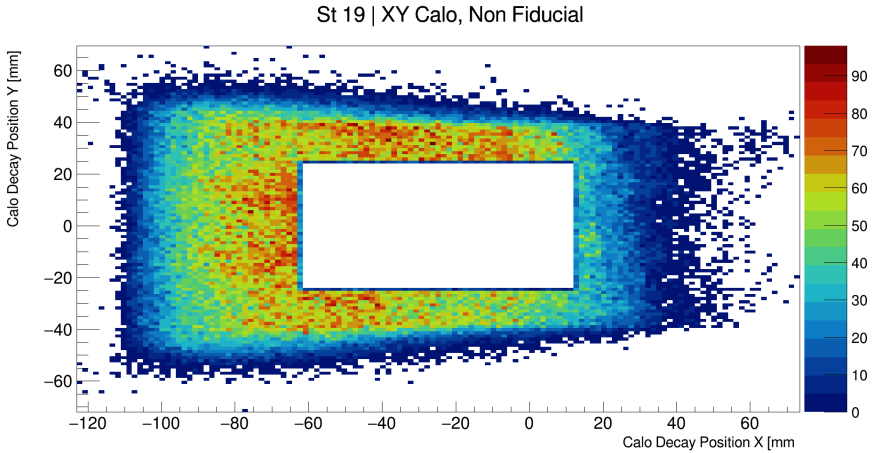
## Europe $\omega_a$

**Sam Grant**

**12th April 2019**

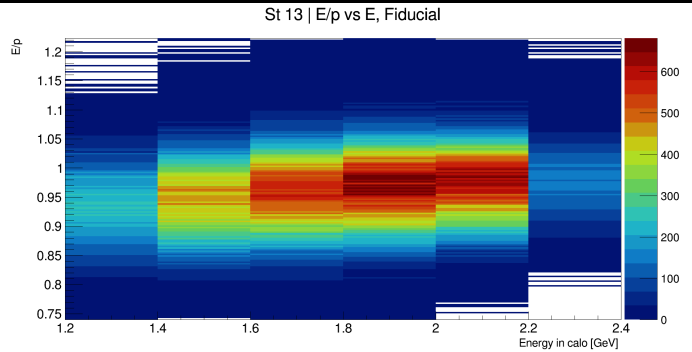
# Calo Fiducial Cut

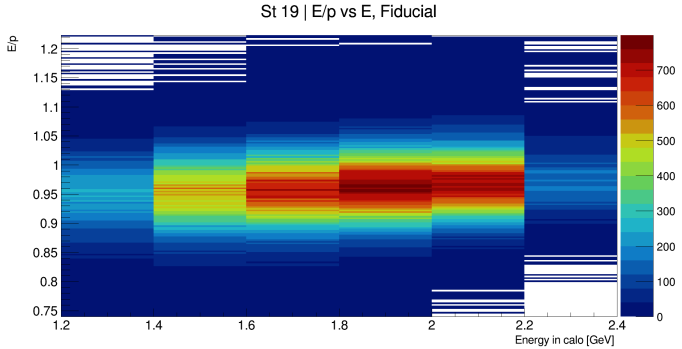


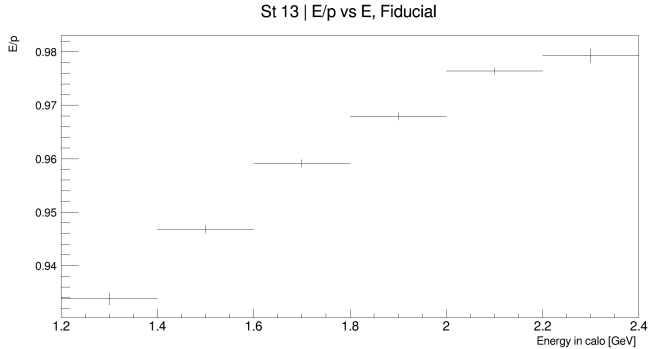



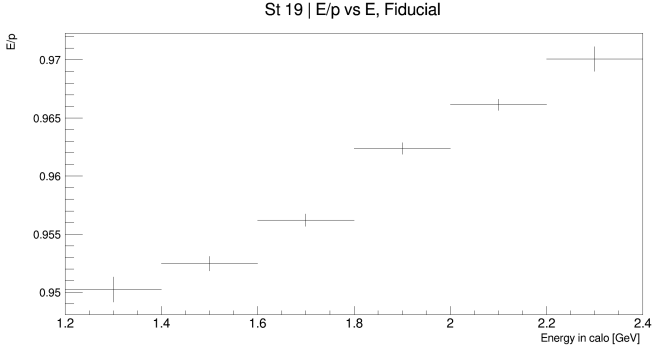

- 3 columns and 2 rows of crystals
- Looked at E/p vs XY and cut out the noisy or low stats regions (which is why it's asymmetrical)

# E/p vs E - Fiducial



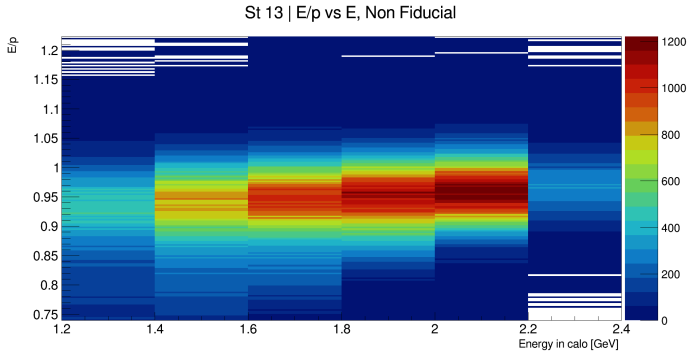



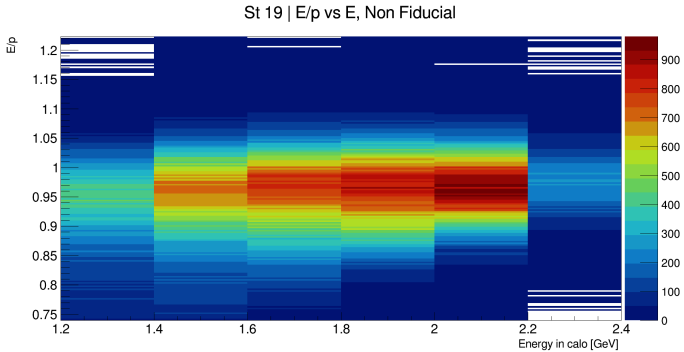



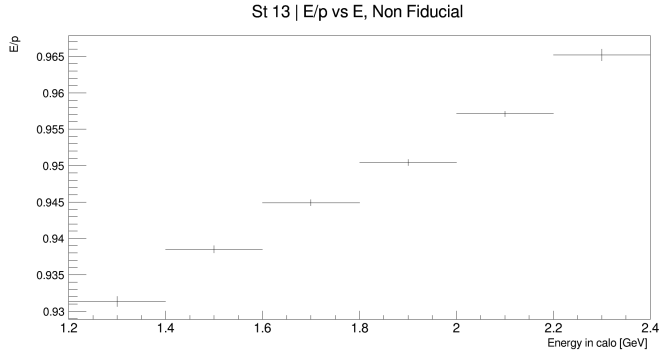



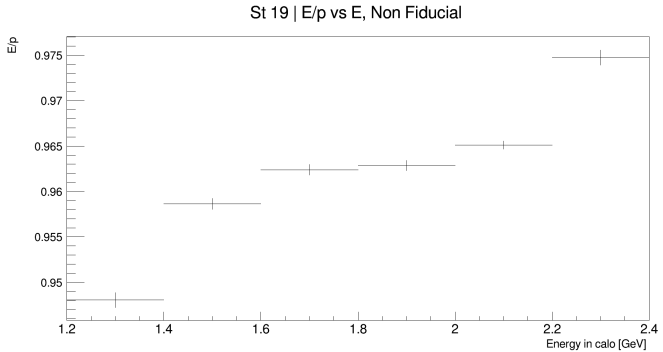

- Set binning to > 3% resolution, so 200 MeV width.
- Time cut at 30 μs applied
- Behaviour perhaps due to the presence of an aluminium wall between tracker and calo

# E/p vs E – Non Fiducial



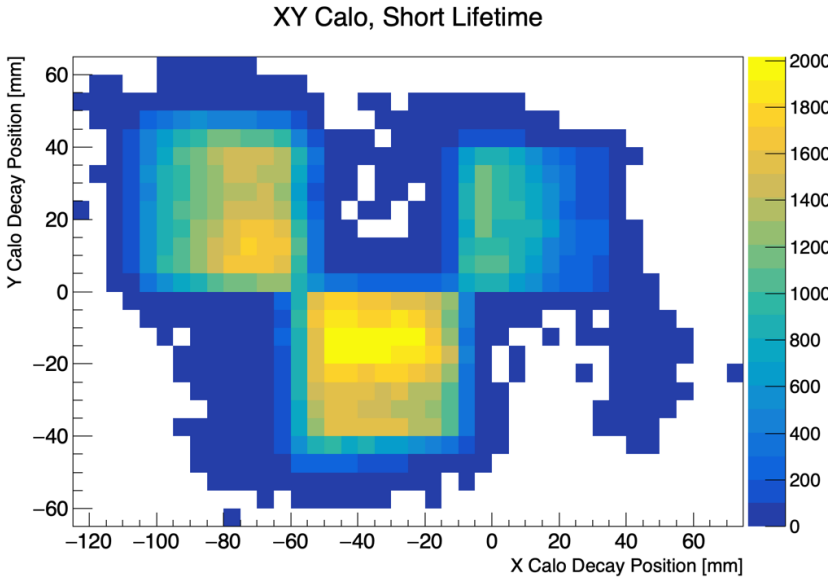



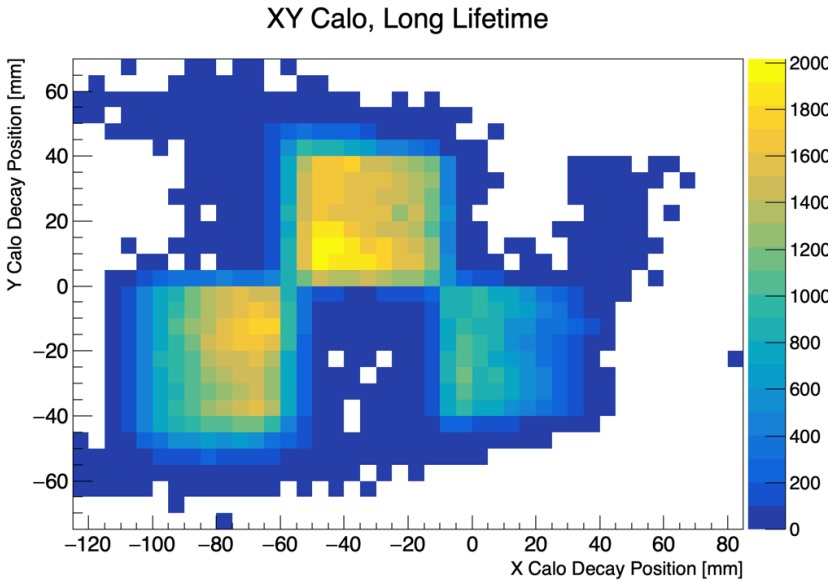




- Set binning to > 3% resolution, so 200 MeV width.
  - Time cut at 30 μs applied
  - Station 19 stands out here

# Long vs short lifetime breaker boards

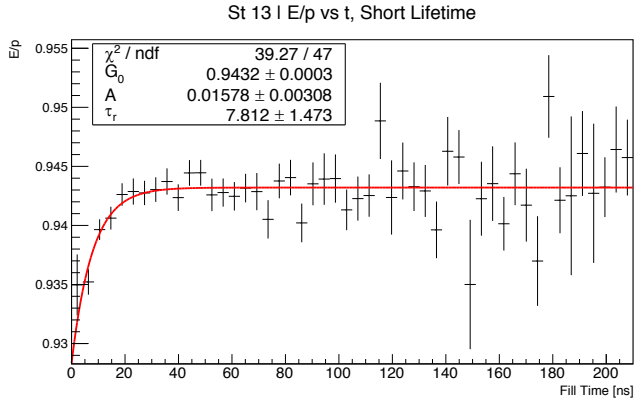


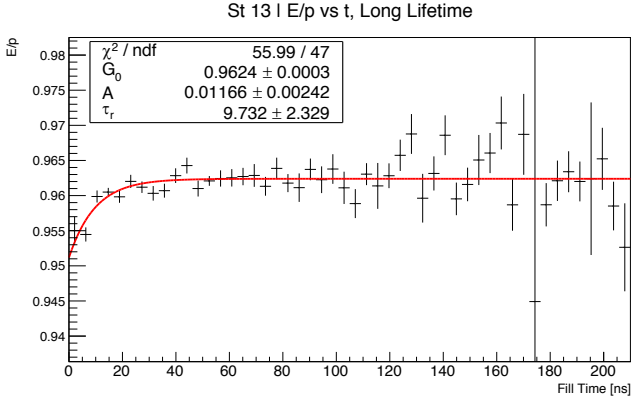



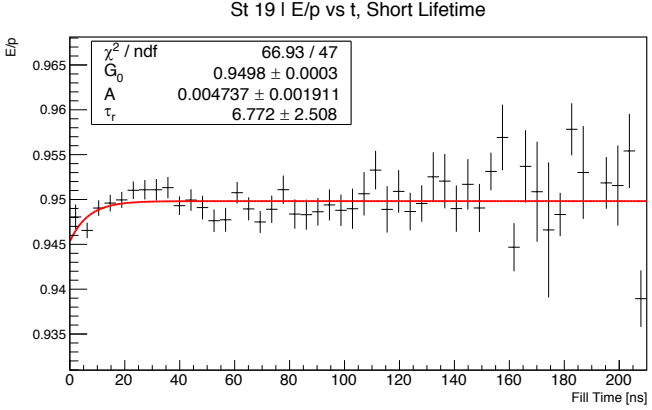

- Short Life Times (by xtal) = {0, 9, 10, 11, 14, 15, 18, 19, 20, 23, 24, 27, 30, 31, 34, 35, 36, 39, 40, 43, 44, 45}
- Different breaker boards mean different recovery times

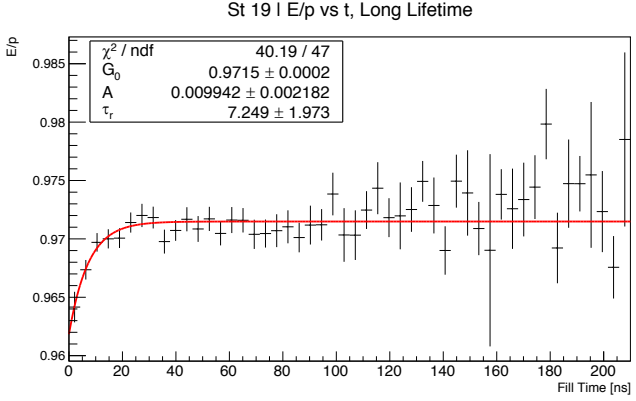
# Recovery times per station

$$G(t) = G_0(1 - Ae^{-t/\tau_r})$$



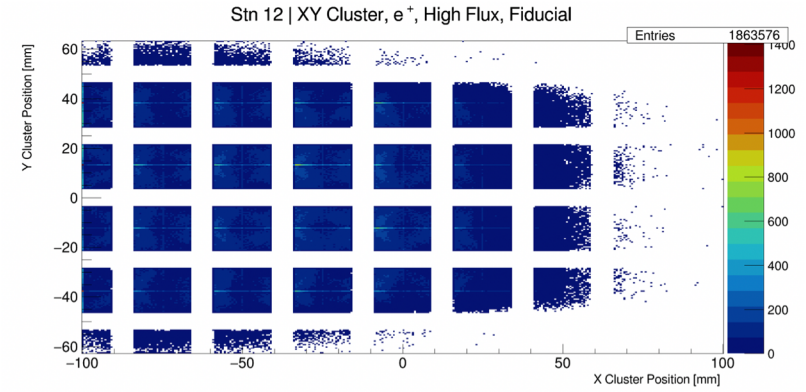



# Now look at fiducial regions of crystals

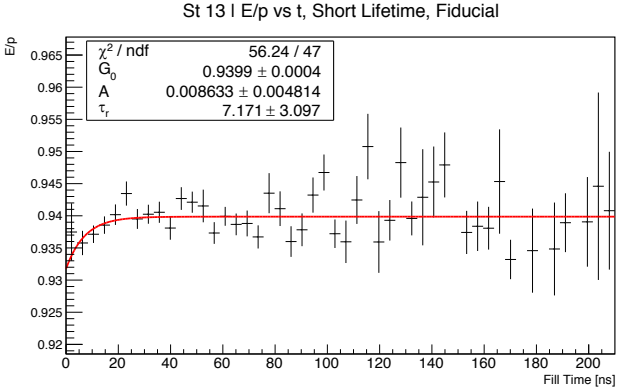
Sam Grant 27/03/2019

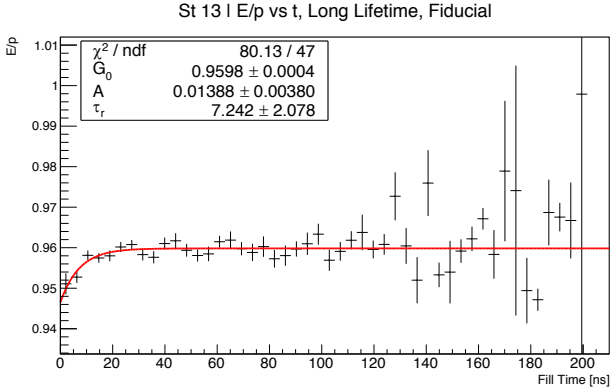
## Fiducial Definition

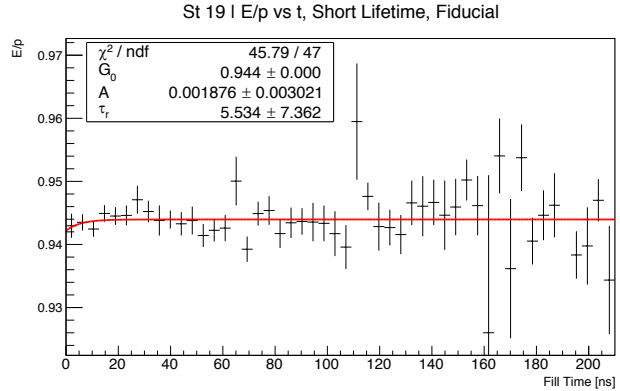


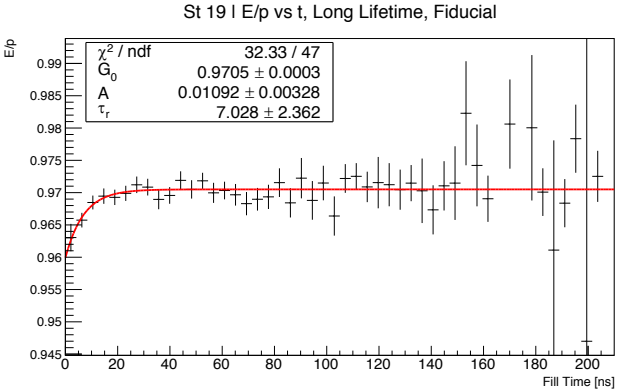

This is what I define as the fiducial region

# Recovery times per station inside individual crystal (not calo!) fiducial region



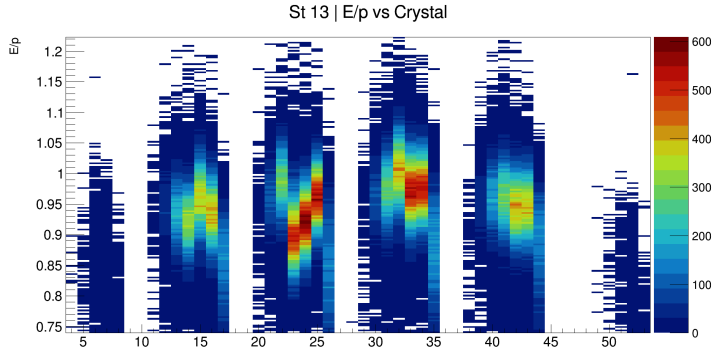



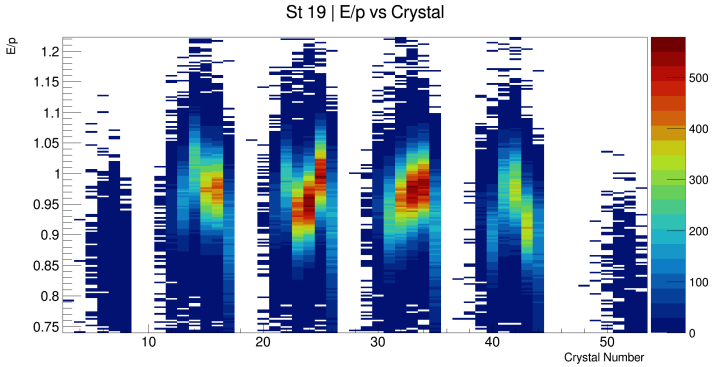



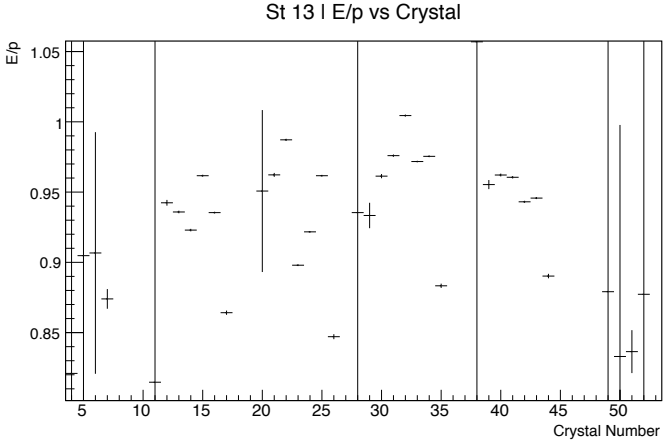



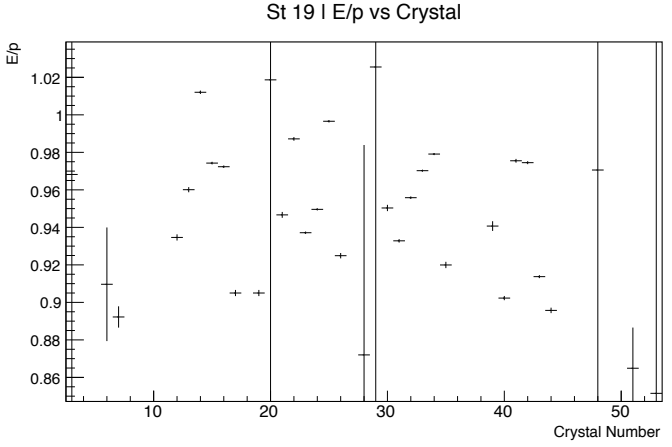

**Microseconds not nanoseconds**

# Gain per crystal

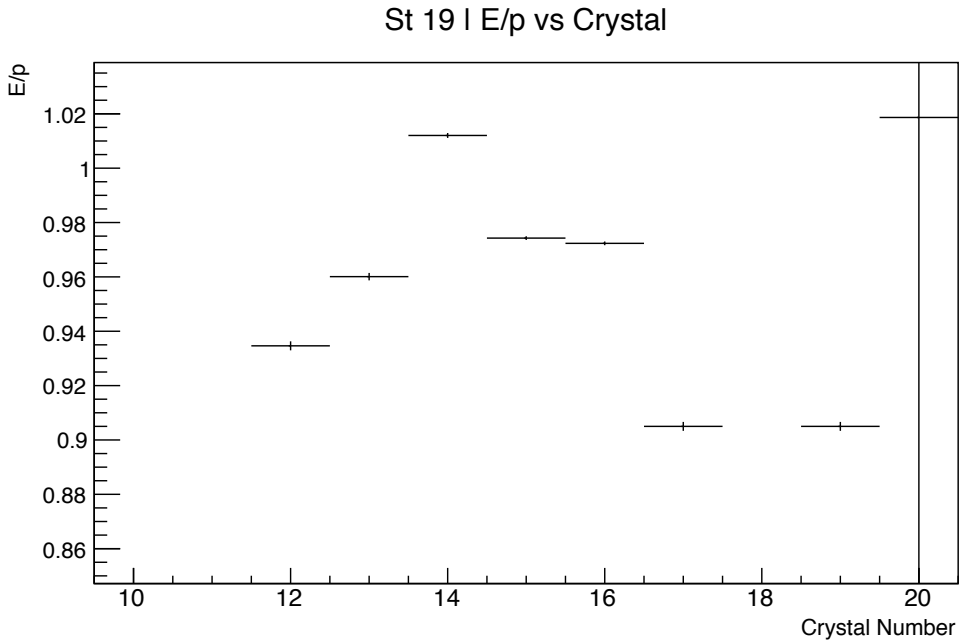


# Gain per crystal, consistent with MIP peaks?




## MIP Peaks

| | |
|---|---|
| 10 | 159.536+/-2.233 |
| 11 | 167.267+/-1.455 |
| 12 | 169.089+/-0.797 |
| 13 | 223.666+/-1.500 |
| 14 | 160.698+/-1.631 |
| 15 | 174.256+/-1.150 |
| 16 | 170.618+/-1.298 |
| 17 | 169.311+/-3.016 |
| 18 | 170.758+/-1.193 |
| 19 | 161.574+/-1.426 |
| 20 | 168.817+/-0.736 |

Just looking at the step sizes, they don’t match. What’s happening?

# Comments

- Since each crystal has it's own gain, I have been trying to normalise the time plots crystal by crystal… So far: bugs!
- I should also put a cut on the energy fraction per crystal relative to the most energetic crystal
- Hopefully these two changes will improve the fits to the time distributions