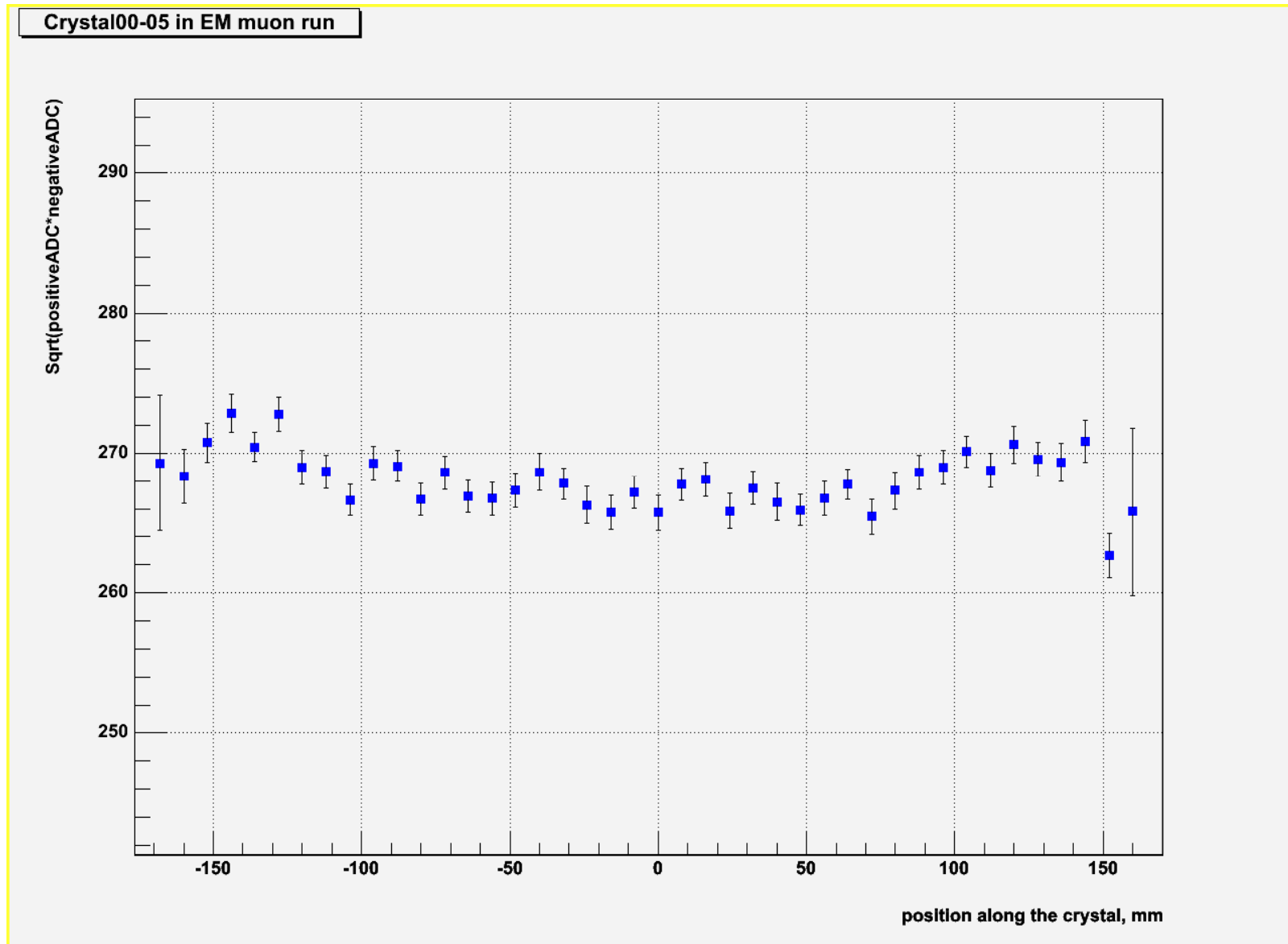


Initial light attenuation study in CAL crystals

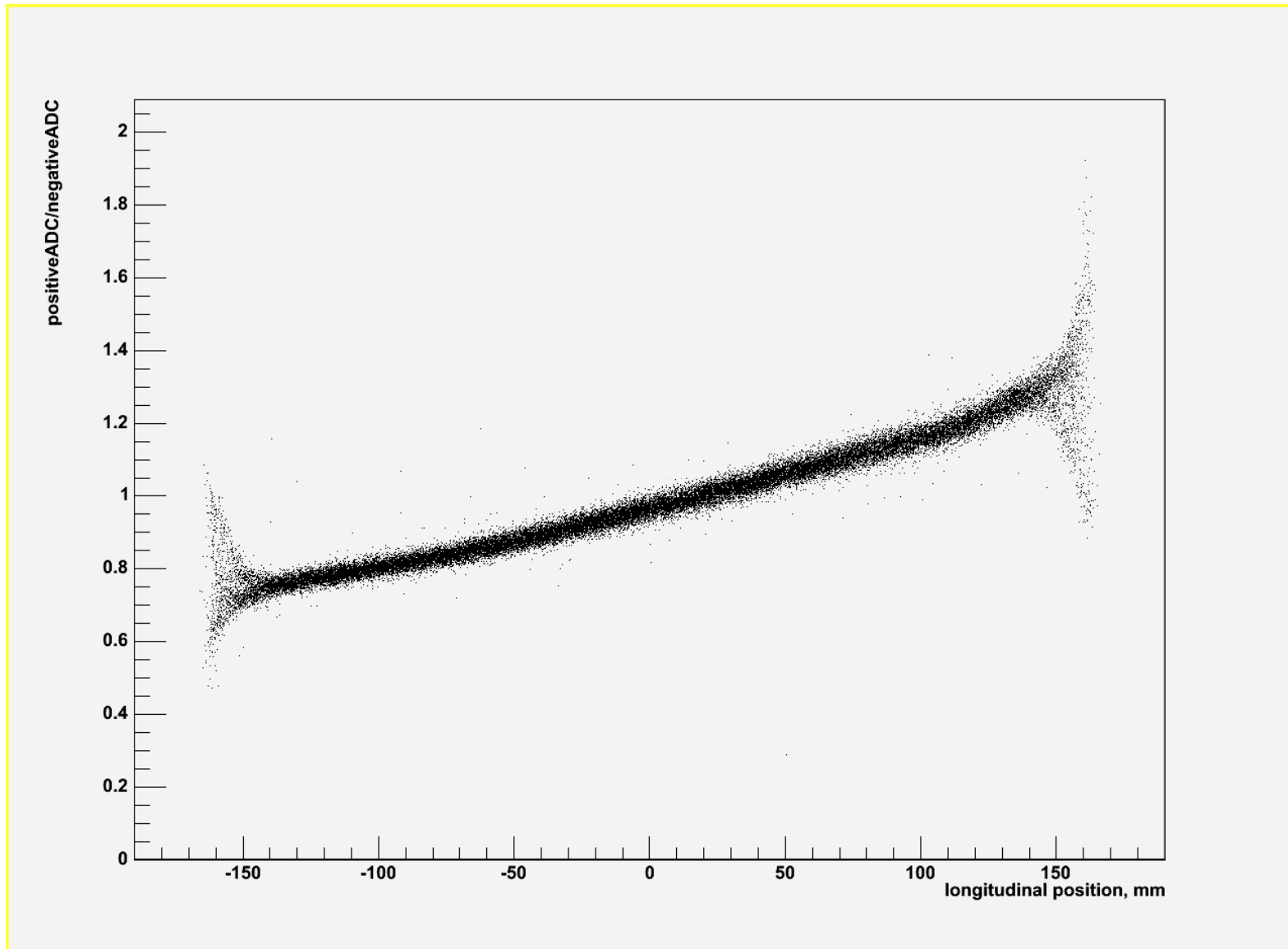
- **Task:** to investigate light attenuation/propagation in CAL crystals using TKR+CAL information
- **Data:** EM cosmic muons runs from SLAC (70 fits files). These have been converted to ROOT digi format, and then reconstructed using EM v2r0402p5
- **Code:** Xin's lightTaperCalib from calibGenCAL package
- **Approach:** one of the ways to parameterize the asymmetry and attenuation is to take a look at the product and the ratio of the signals from crystal's ends
 - if light in the crystal attenuates according to the exponential law then the product of the signals from the two ends should be a constant; the ratio of the two signals has small uncertainty (takes out Landau fluctuations). Combining the ratio and the product we can have tapering and asymmetry curves.
- **Event selection:**
 - $\cos(\theta) \leq -0.95$ ($\theta \leq 18.2$ deg)
 - only events with the signal higher than $\langle \text{pedestal} \rangle + 10\sigma$, plus the requirement that signals in 2 adjacent crystals are smaller than $\langle \text{pedestal} \rangle + 4\sigma$ were considered, to cut off clipping events
 - pedestal corrected, path length corrected
 - data from crystals 0-9 in layer 0 were studied in order to have accurate TKR data (crystals 10 and 11 have no statistics because of dead TKR strips).

Product of ADC signals from crystal's ends

- deviation from a constant reflexes the fact that the light taper curves are not perfectly exponential

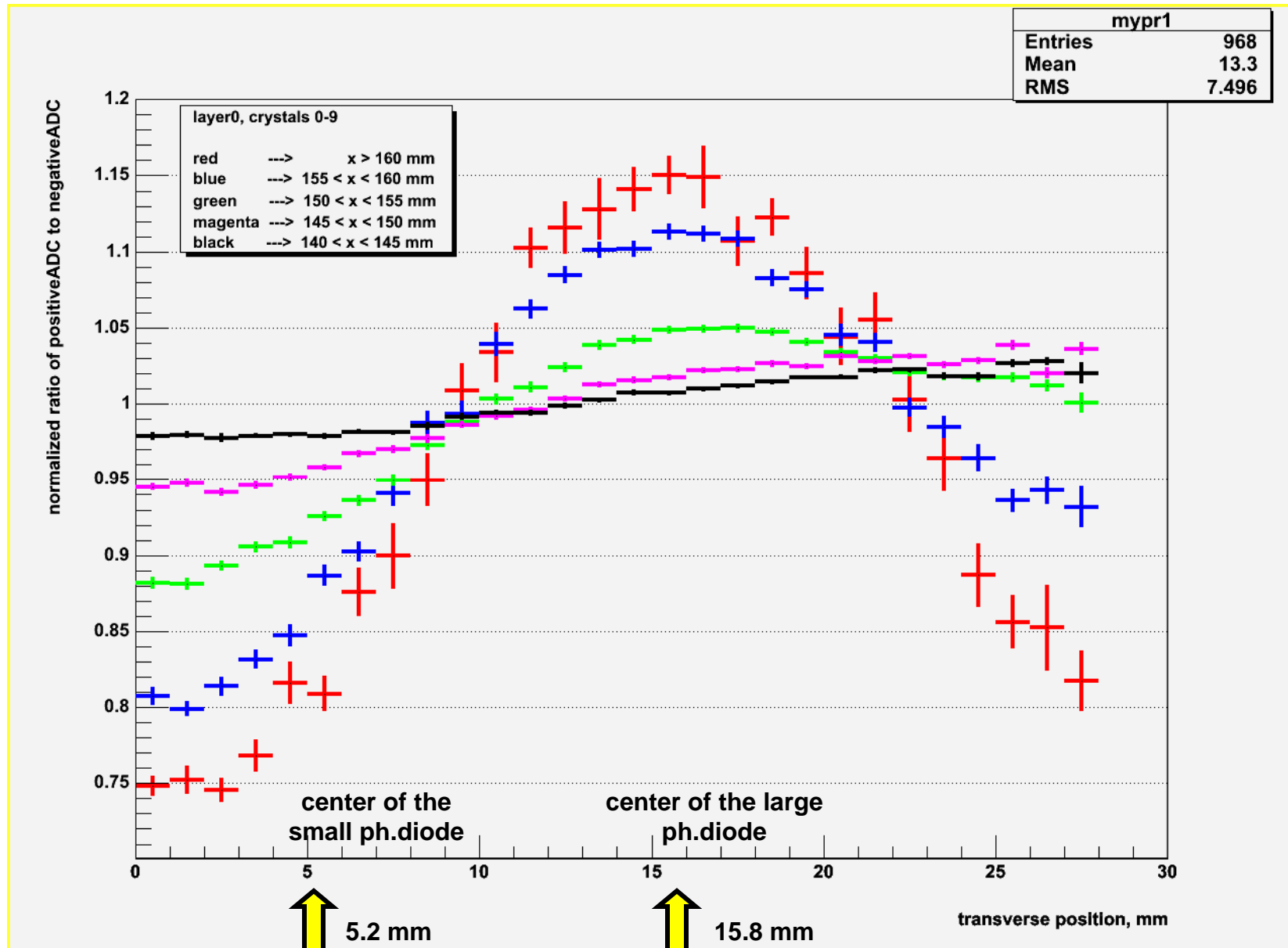


Ratio of ADC signals



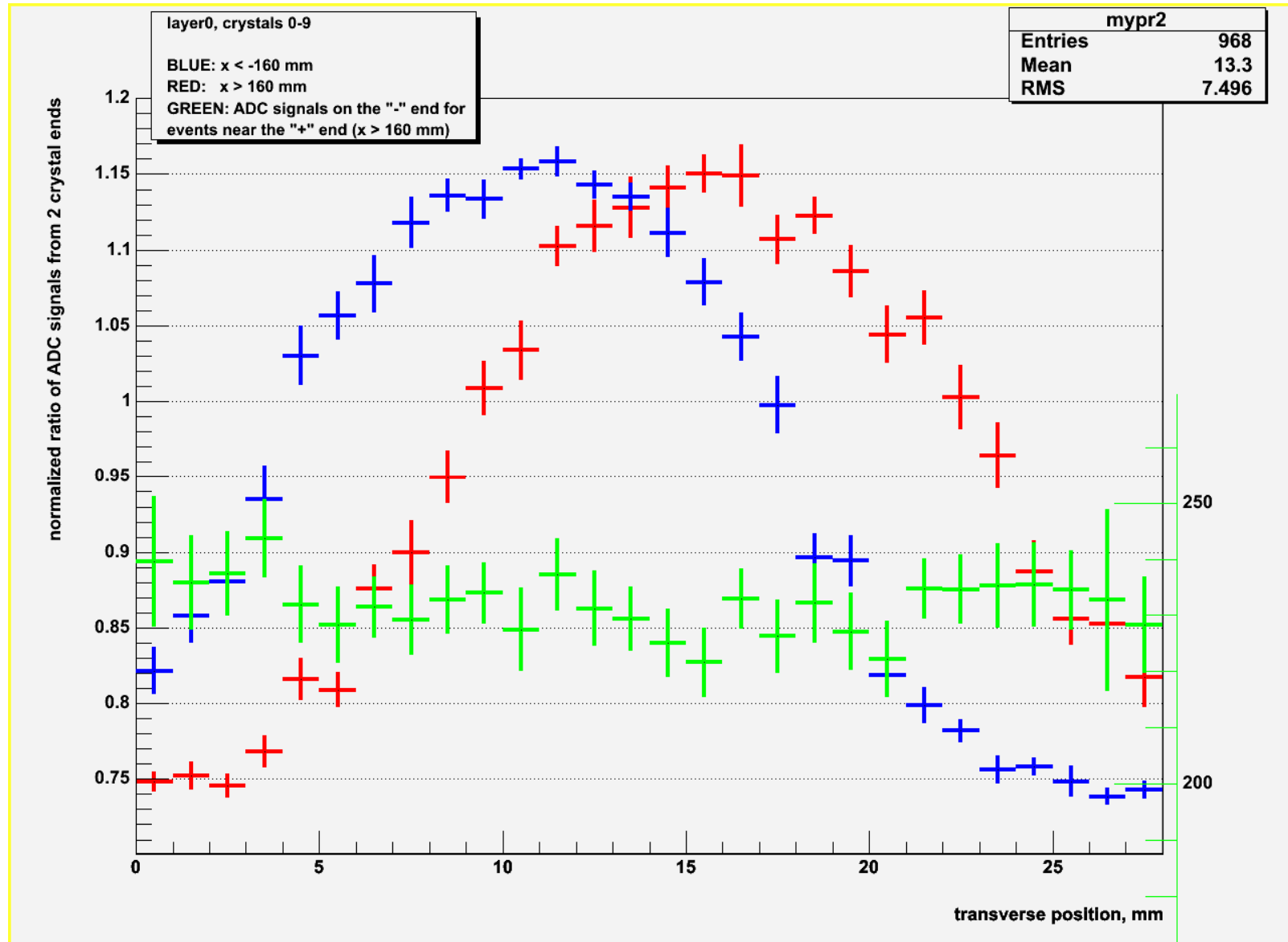
Transverse distribution of the signals ratio near the end

- looking at the signal from the large photodiode



Looking at the two ends:

- ratio NEG/POS near the negative end; POS/NEG near the positive end
- far end signal does not vary much ($\sim 5\%$) with the transverse position – light gets diffused on its way



Things to do

- Produce near-term asymmetry and attenuation calibration data types using ratio and product data
- Continue study of direct vs diffuse light effects
- How can we use this to improve the calibration near the ends of the crystal?
- Look at the data from multiple crystals