

The logo of the University of Sussex, featuring the letters 'US' in a large, dark blue, serif font.

UNIVERSITY
OF SUSSEX

11th October 2017

G.Lerner, I.Vivarelli (University of Sussex)

BEAM PROFILE STUDIES AND ADC COUNTS / ENERGY PLOTS

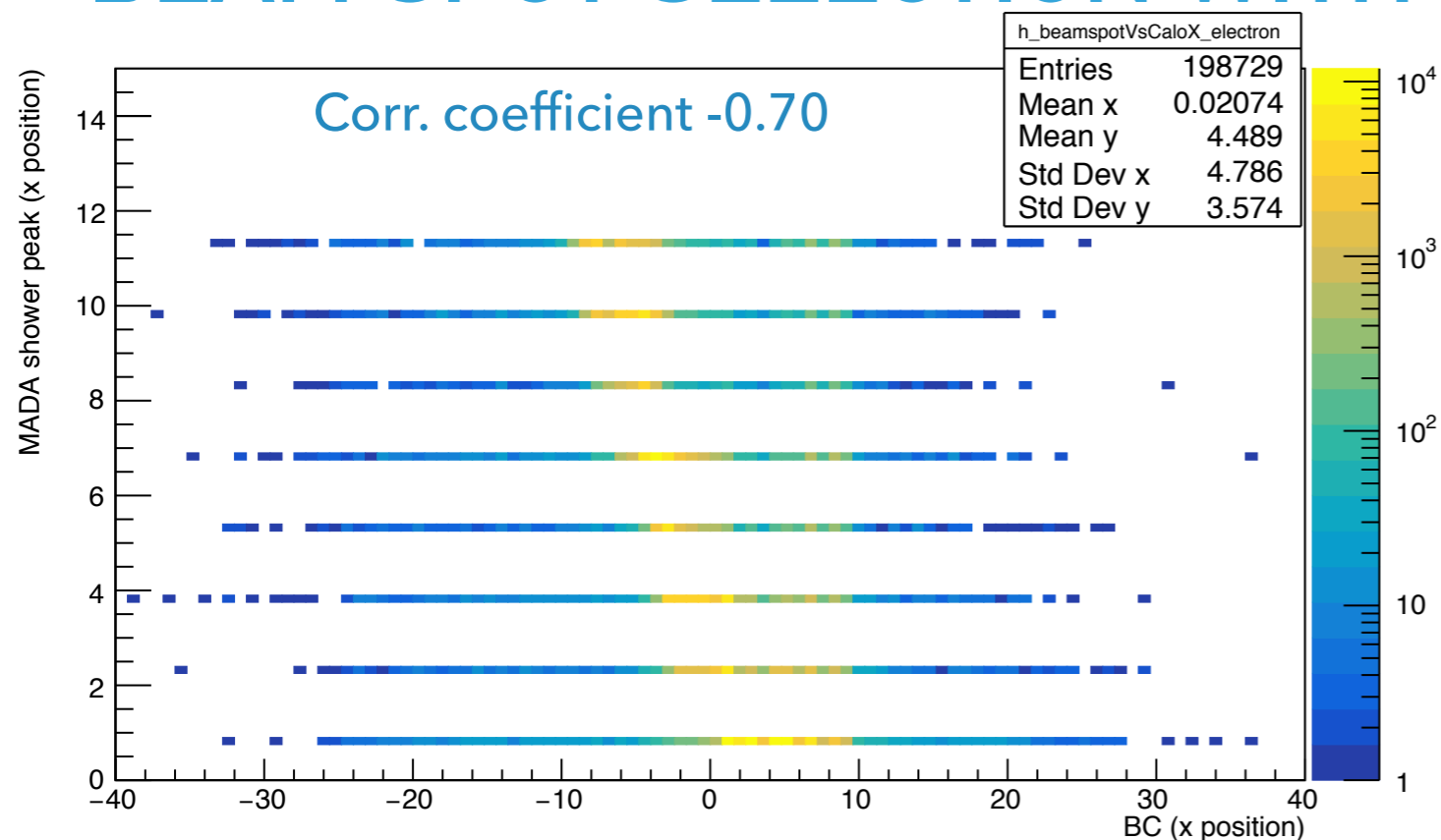
INTRODUCTION

- ▶ Followup of previous update (13 oct), focused on the beam profile selection.
- ▶ First part of the talk: comparison between calo-based and DWC-based beam spot selections by studying the correlation between the two strategies.
- ▶ Second part: ADC counts / energy plots for Čerenkov fibers using the two types of beam spot cuts.

BEAM SPOT SELECTION WITH DWC AND CALORIMETER

- ▶ In the last meeting we discussed two possible approaches for the selection of central showers in the calorimeter:
 - ▶ DWC-based: cut on the x and y coordinates of the hits in the wire chamber.
 - ▶ Calo-based: ask that the most energetic fiber is in the central 4x4 box.
- ▶ To compare the methods, we made 2D distribution of the x and y coordinates in the DWC and the x and y coordinates of the center of the fibers.
- ▶ The x and y coordinate of each fiber is defined assuming a distance of exactly 1.5mm between them and constructing the 8x8 grid, such that each channel has its own position.

BEAM SPOT SELECTION WITH DWC AND CALORIMETER

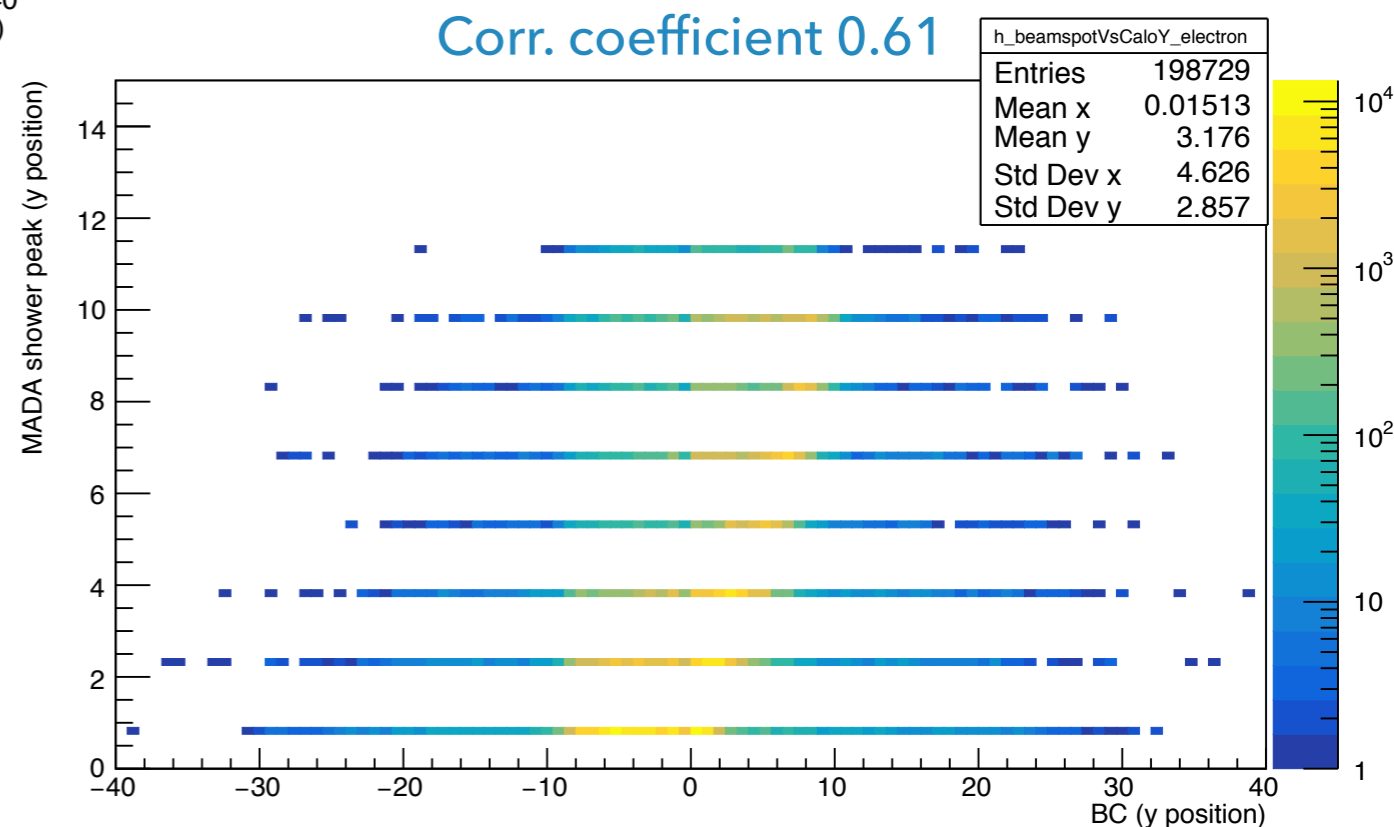


Correlation between x and y coordinates for an electron selection in run number 12334

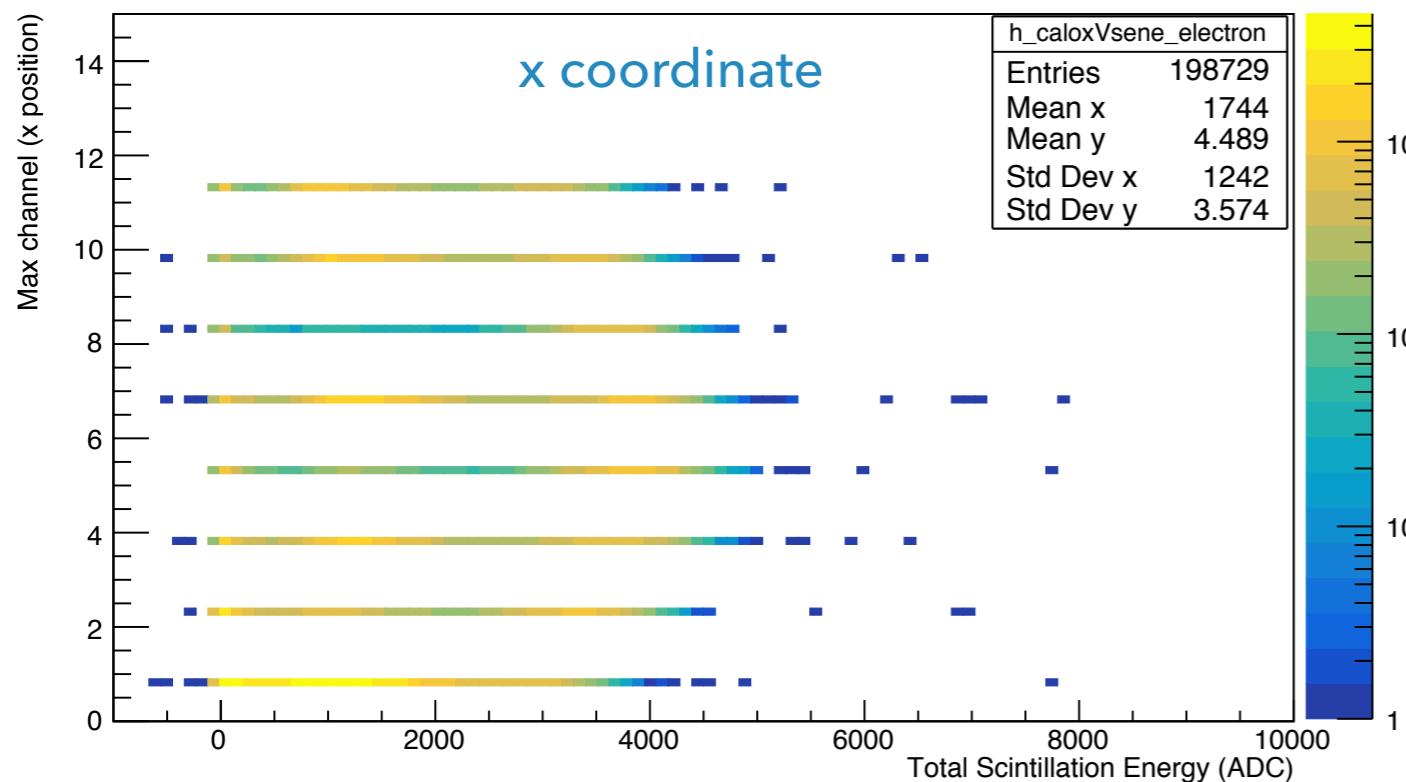
Calo based selection: discard the top two and bottom two rows.

DWC based selection:

$-10\text{mm} < x < 0\text{mm}$, $2\text{mm} < y < 10\text{mm}$

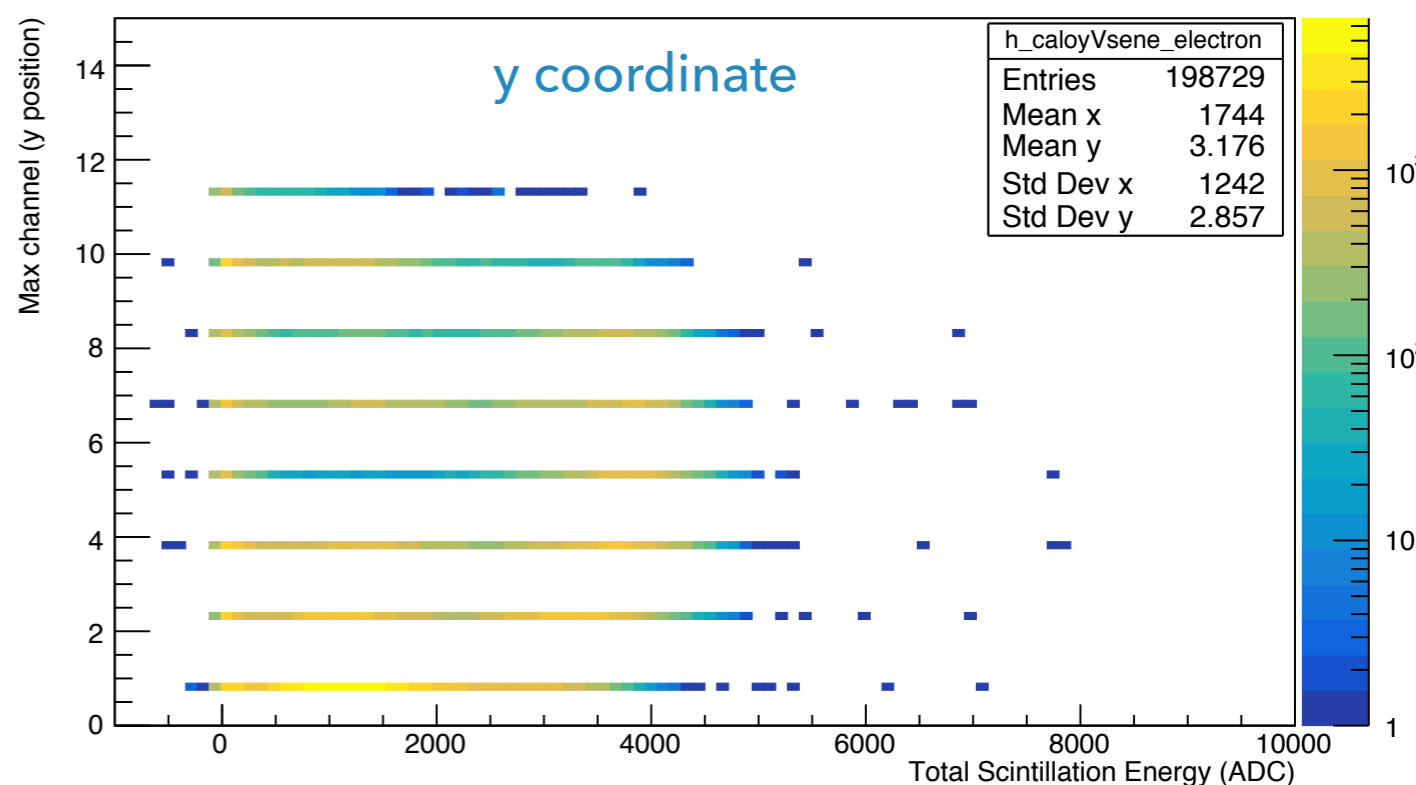


CALO X/Y COORDINATES VS SCINTILLATION ENERGY



When the peak of the shower is in the external fibers, the total scintillation energy is (on average) significantly lower.

Plot made in run number 12334 (30 GeV electron beam, UltraLow PDF) for an electron selection.

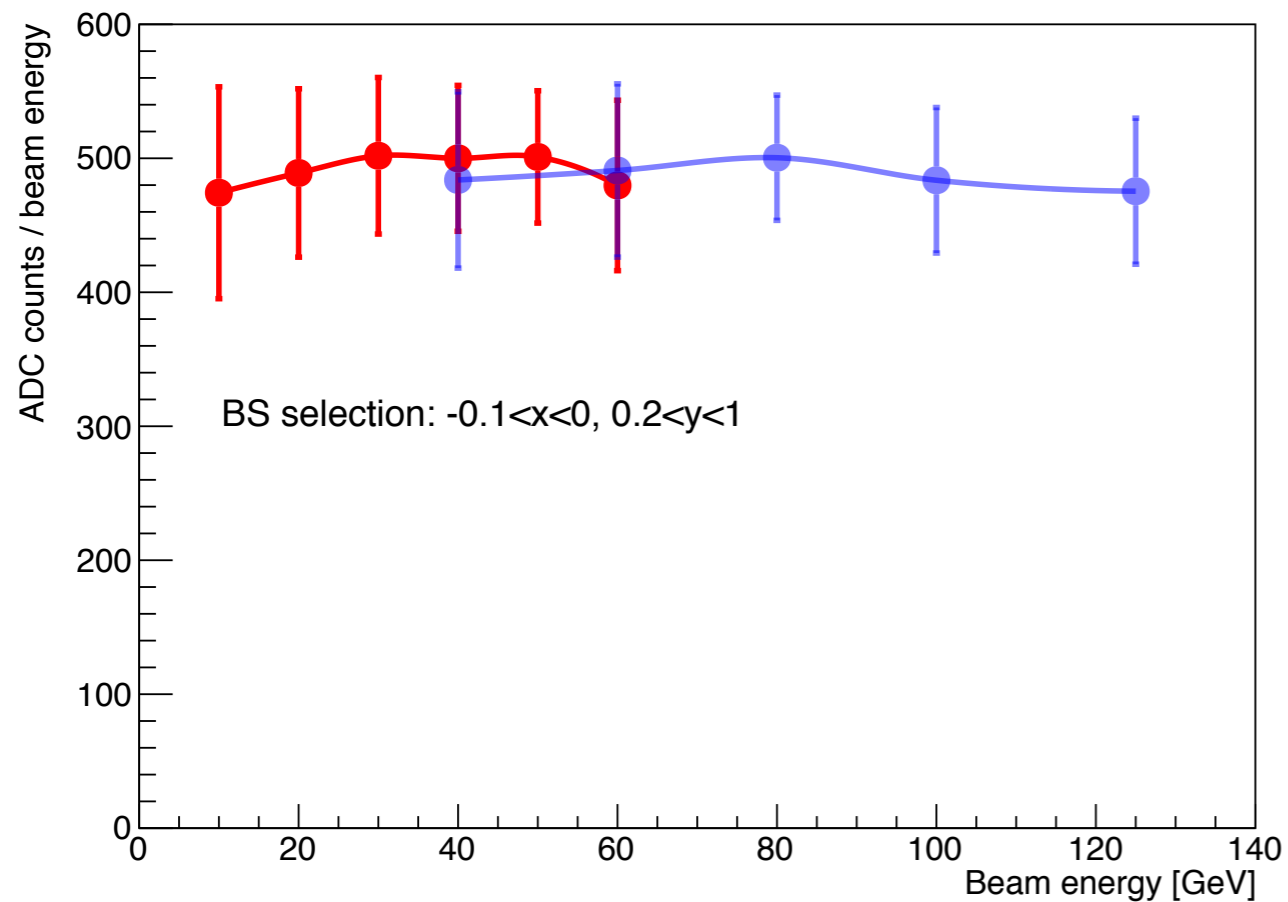


ELECTRON ADC COUNTS (ČERENKOV) / BEAM ENERGY

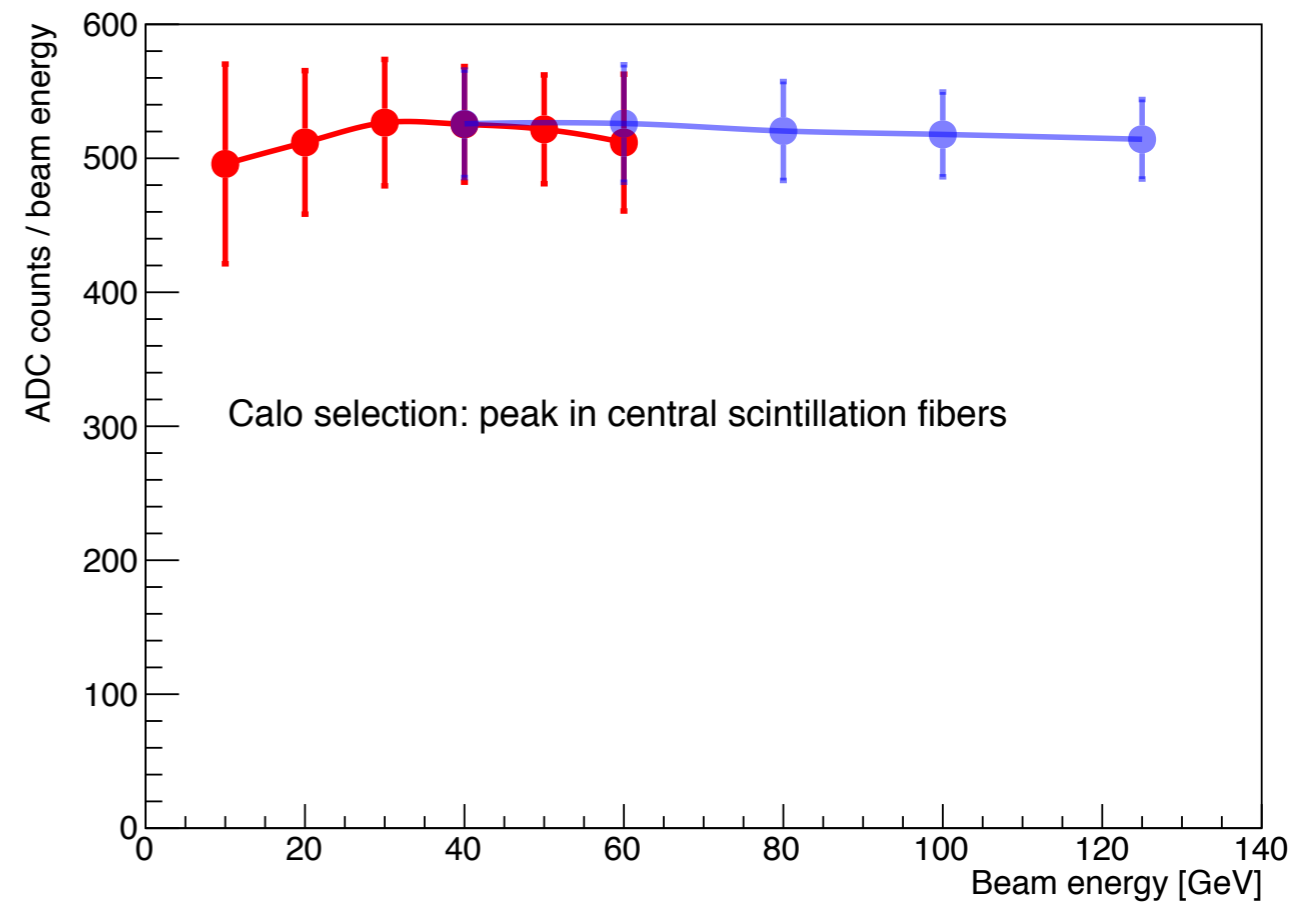
- ▶ We plotted the ratio between the ADC counts of the electron peak in Čerenkov fibers and the beam energy, as a function of the beam energy.
- ▶ Similar to the plots that were already discussed in the previous meetings.
- ▶ We made it applying both type of beam spot selection (calo based and DWC based).
- ▶ We are showing ADC counts / beam energy instead of number of photoelectrons / beam energy (we don't know how to convert ADC counts into number of photoelectrons).

ELECTRON ADC COUNTS (ČERENKOV) / BEAM ENERGY

Cherenkov linearity with Intermediate PDE setting



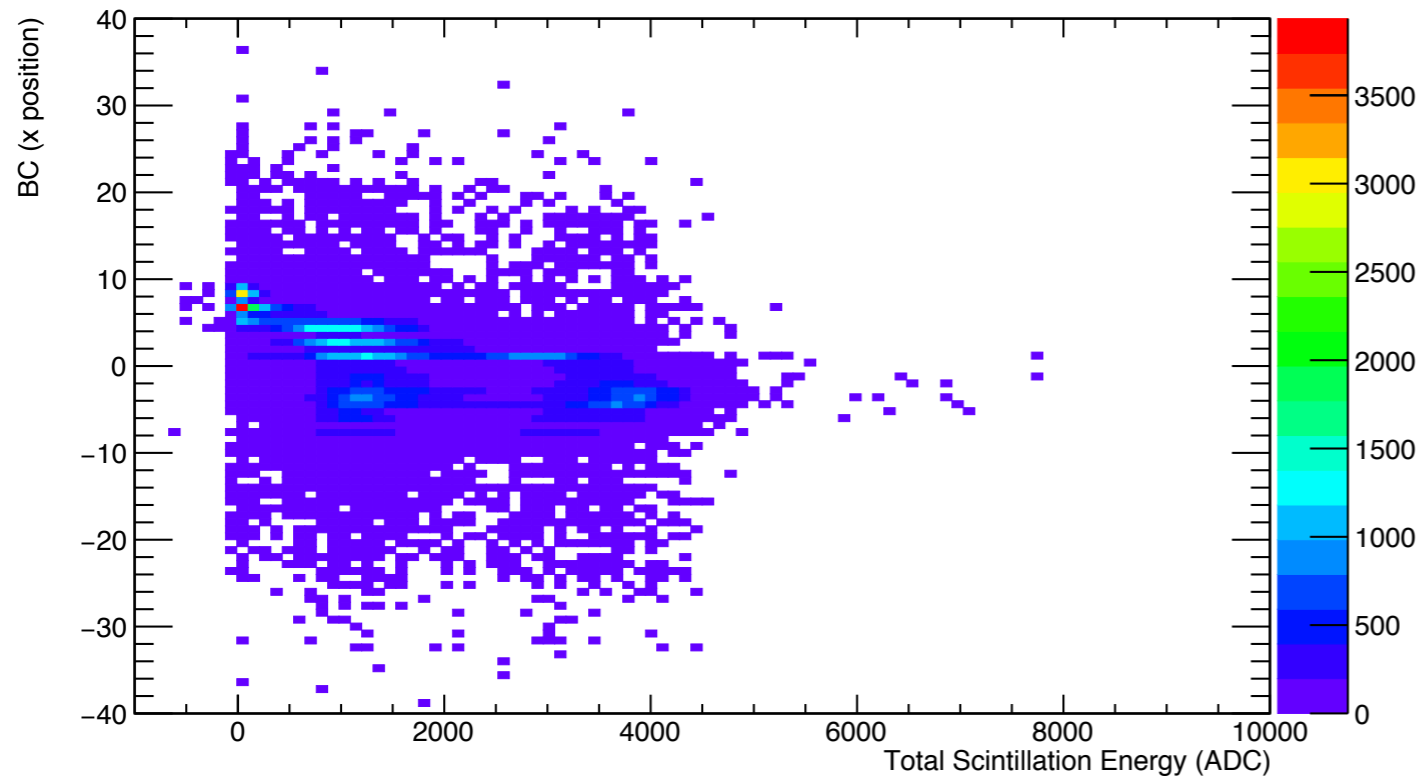
Cherenkov linearity with Intermediate PDE setting



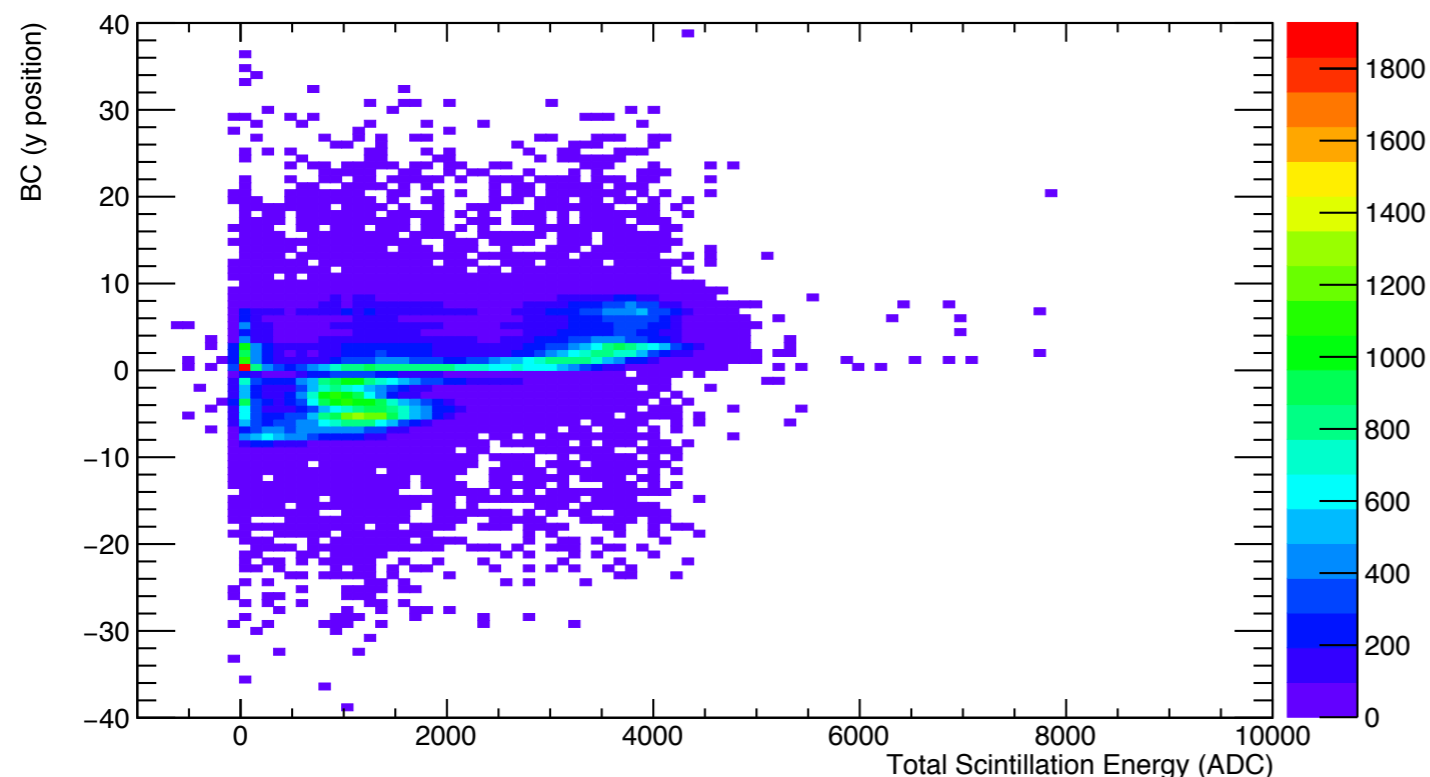
- ▶ The ADC counts are the mean value of the gaussian fit of the peaks and the uncertainty is the corresponding width.
- ▶ Consistent results with the two strategies.

BACKUP

LAST MEETING'S PLOTS: X/Y IN DWC VS SCINTILLATION ENERGY



X coordinate: the beam center is around $x=7\text{cm}$ and the detector is clearly aligned with it, as can be seen by the peaks in energy deposit.



Y coordinate: we observe a 'step-like' behaviour where for $y > 0$ the energy peaks at ~ 3500 ADC counts, while for $y < 0$ it peaks at ~ 1000 . What is the origin of this?