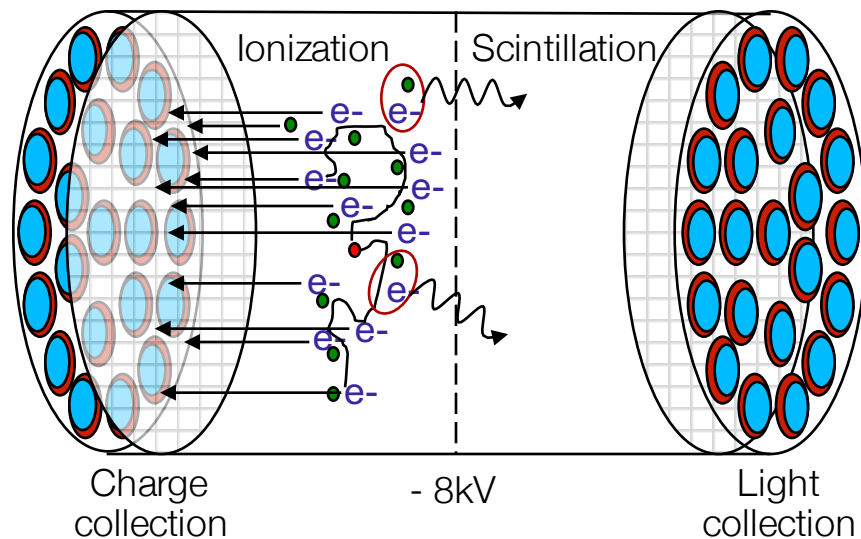


# Deep Neural Networks for Energy and Position Reconstruction in EXO-200



## EXO-200 experiment

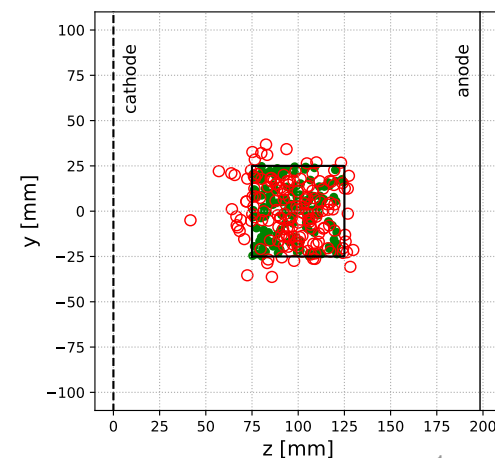
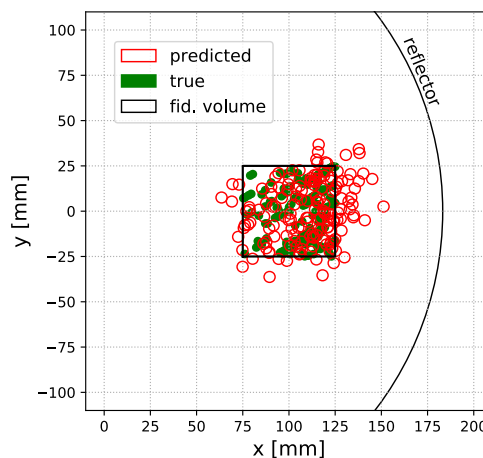
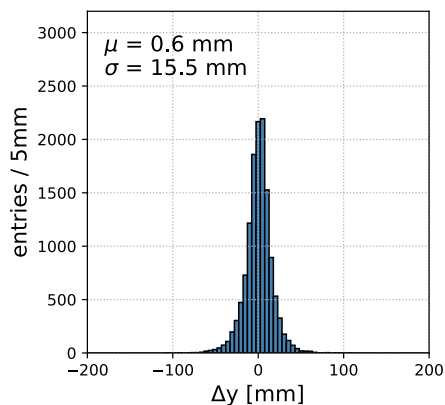
- TPC for neutrinoless double beta decay in  $^{136}\text{Xe}$  filled with 175 kg LXe
- Energy and 3D position reconstruction by simultaneous detection of light and charge
- Multi parameter analysis



## Position reconstruction from raw light waveforms with Convolutional NNs

- Completely data driven training against truth labels from charge signals
- Performance of neural network:

$$\sigma_{3D} = 24.5 \text{ mm}$$



# Deep Neural Networks for Energy and Position Reconstruction in EXO-200



## Energy reconstruction from raw charge waveforms with Convolutional NNs

- Training on MC events uniformly distributed in energy
- Reconstruction works over the energy range for MC (bottom) and real calibration data (right)
- Resolution ( $\sigma$ ) at the  $^{208}\text{Tl}$  full absorption peak (2615 keV) after combining with light channel DNN: 1.65 % (for SS events: 1.50 %) (EXO-200 Recon: 1.70 % (SS: 1.61 %))

