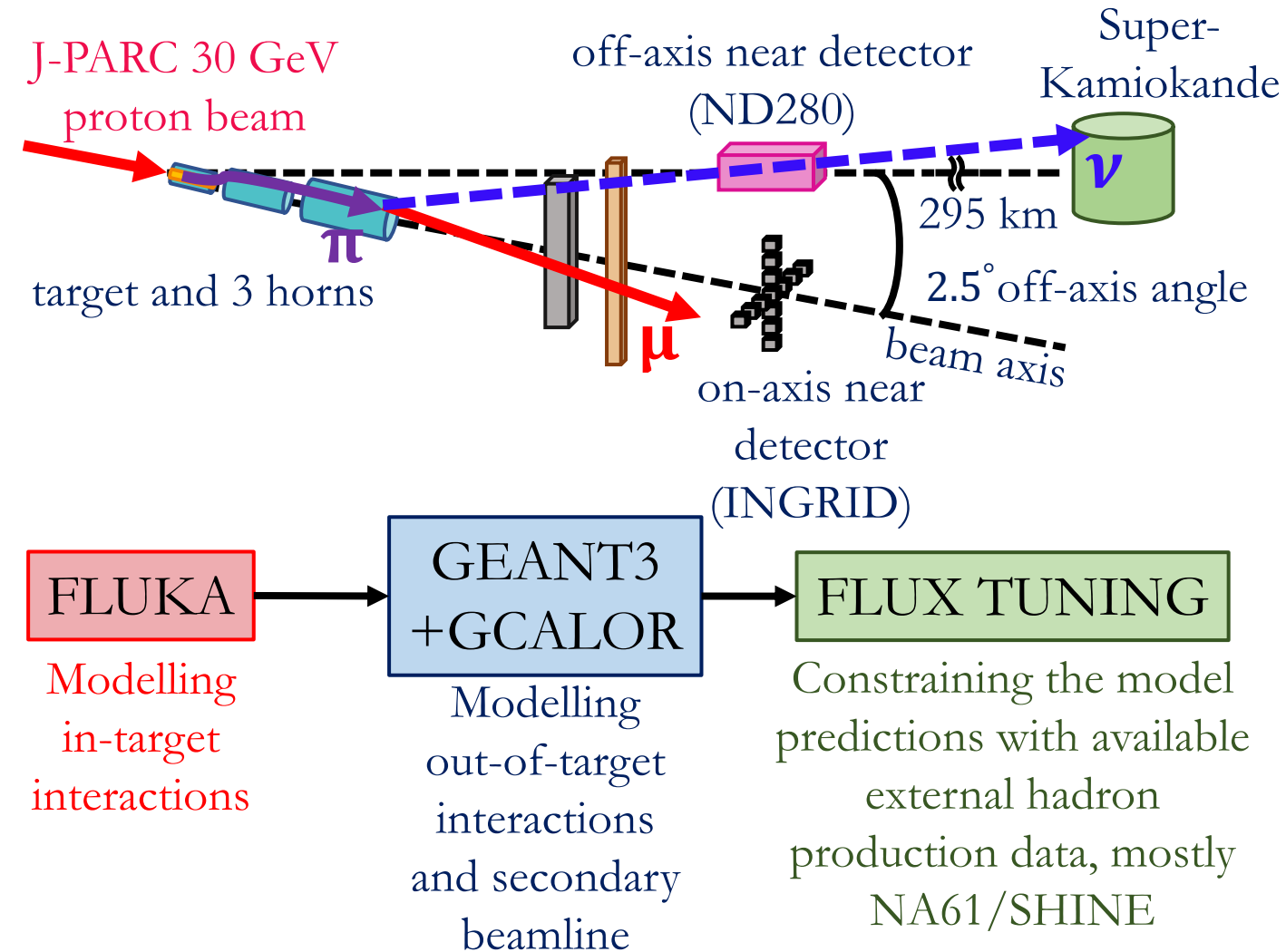
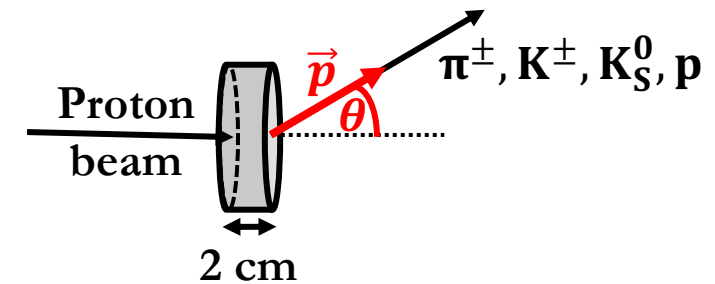


Modelling the T2K Neutrino Flux

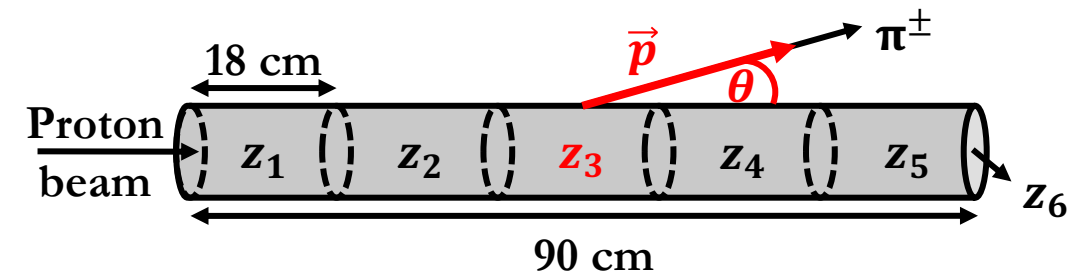


NA61/SHINE Measurements for T2K

Currently, the official T2K flux prediction is based on **NA61 2009 thin-target** data:



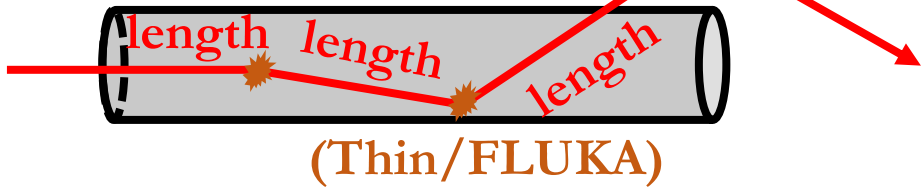
Presented are preliminary flux predictions using the **NA61 2009 replica-target** data:



T2K Flux Tuning: Thin vs. Replica

1. Thin-Target Tuning (Thin/GCALOR)

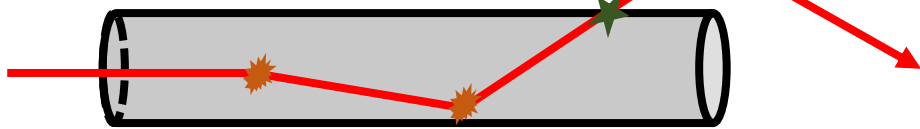
(Thin/FLUKA)



2. Replica-Target Tuning (thin-target data still used for exiting K^\pm, K_S^0, p)

(Thin/GCALOR)

(Replica/FLUKA)



$$W_{\text{thin}}^{\text{mult}} = \frac{N_{\text{thin}}}{N_{\text{sim}}} \quad \& \quad W_{\text{replica}}^{\text{mult}} = \frac{N_{\text{replica}}}{N_{\text{FLUKA}}}$$

$$W_{\text{thin}}^{\text{length}} = \frac{\sigma_{\text{data}}}{\sigma_{\text{sim}}} e^{-\rho x(\sigma_{\text{data}} - \sigma_{\text{sim}})}$$

Impact of Replica-Target Measurements On The T2K Flux Uncertainty

- Reduction of flux uncertainty is vital for T2K neutrino cross section measurements
- Flux uncertainty affects T2K's sensitivity to measuring CP asymmetry (δ_{CP}) in neutrino sector
- **Total flux uncertainty at T2K flux peak (~600 MeV) reduced from ~10% to ~5%**

