

Charged current single pion production on SBND

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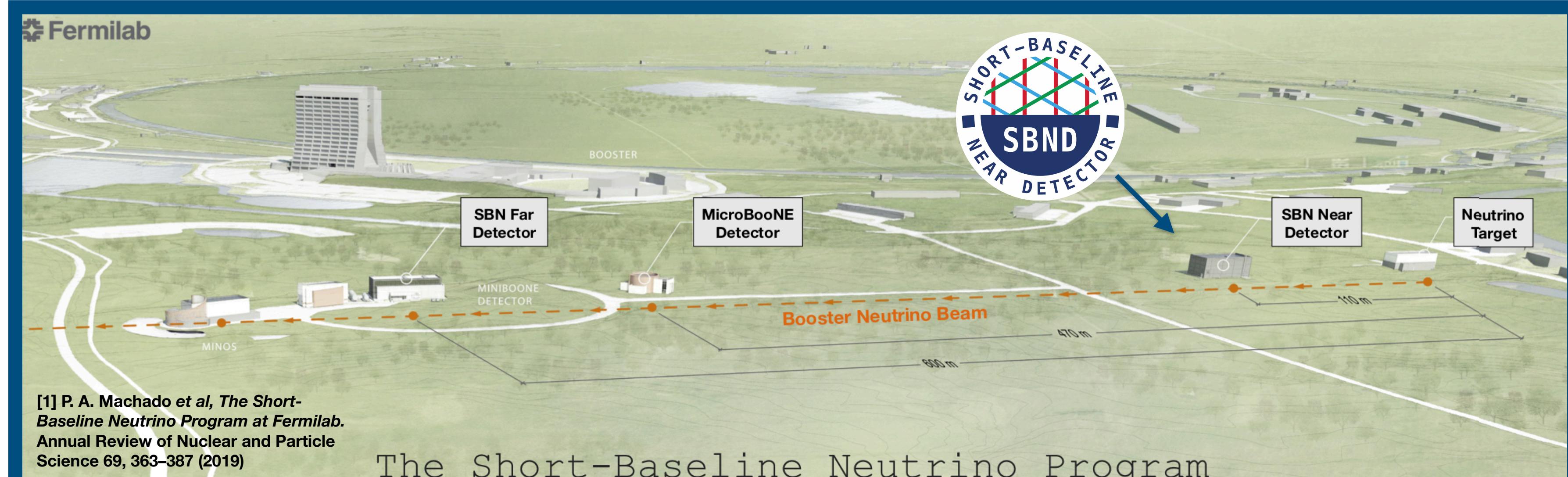


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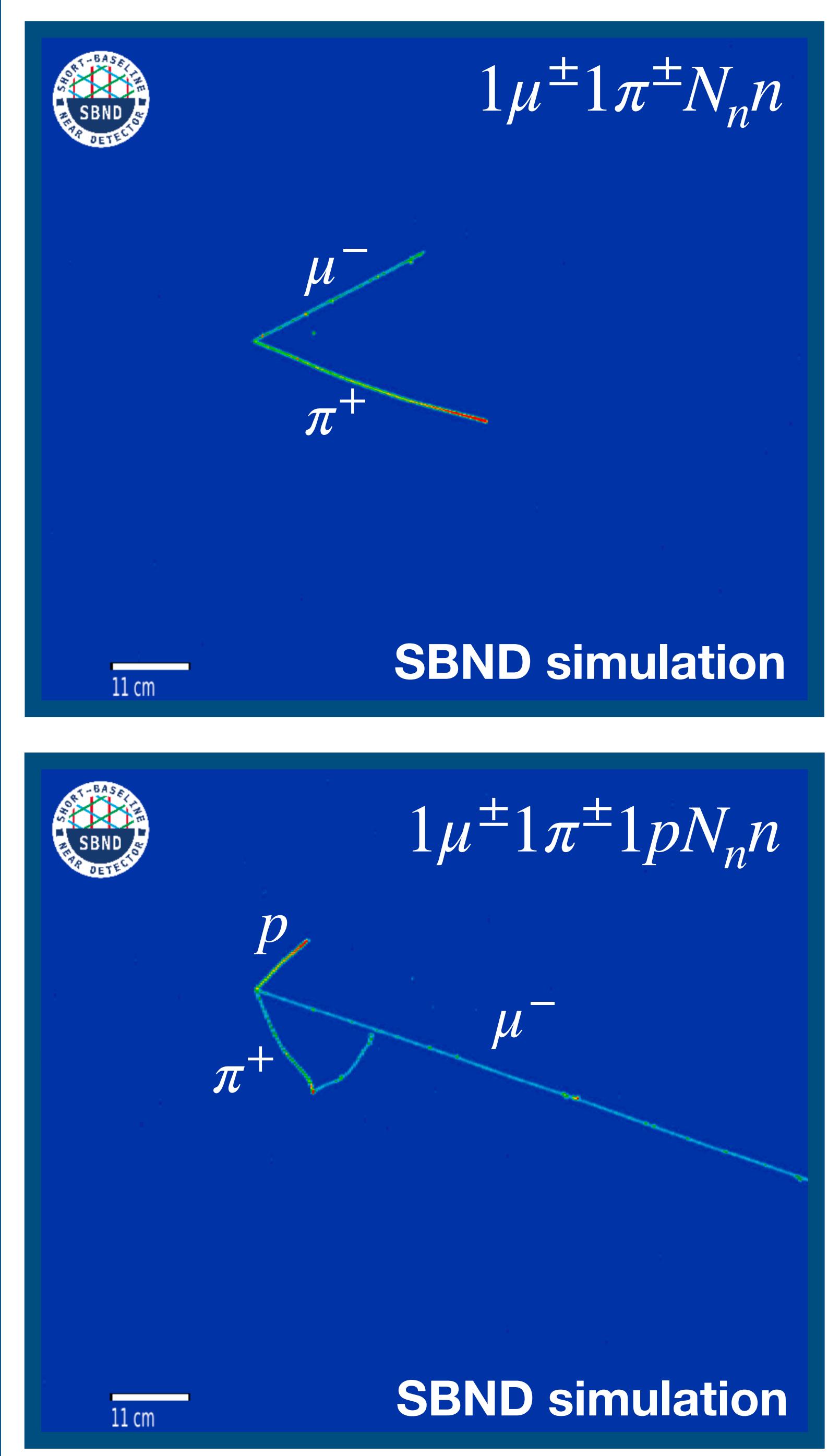
The Short-Baseline Near Detector

The **Short-Baseline Neutrino** program [1] (SBN) is a 3 detector experiment along the **Booster Neutrino Beam** (BNB) designed to investigate MiniBoone anomalies in neutrino oscillations

The **Short-Baseline Near Detector** (SBND), currently in commissioning, is a 112 ton active volume **Liquid Argon Time Projection Chamber** (LArTPC) located 110 m from the BNB target



Event topology



Charged Current single pion production on SBND

Charged Current Single Pion production (**CC1 π**) is a muon-neutrino CC interaction with 1 charged pion. Exclusive channels of interest:

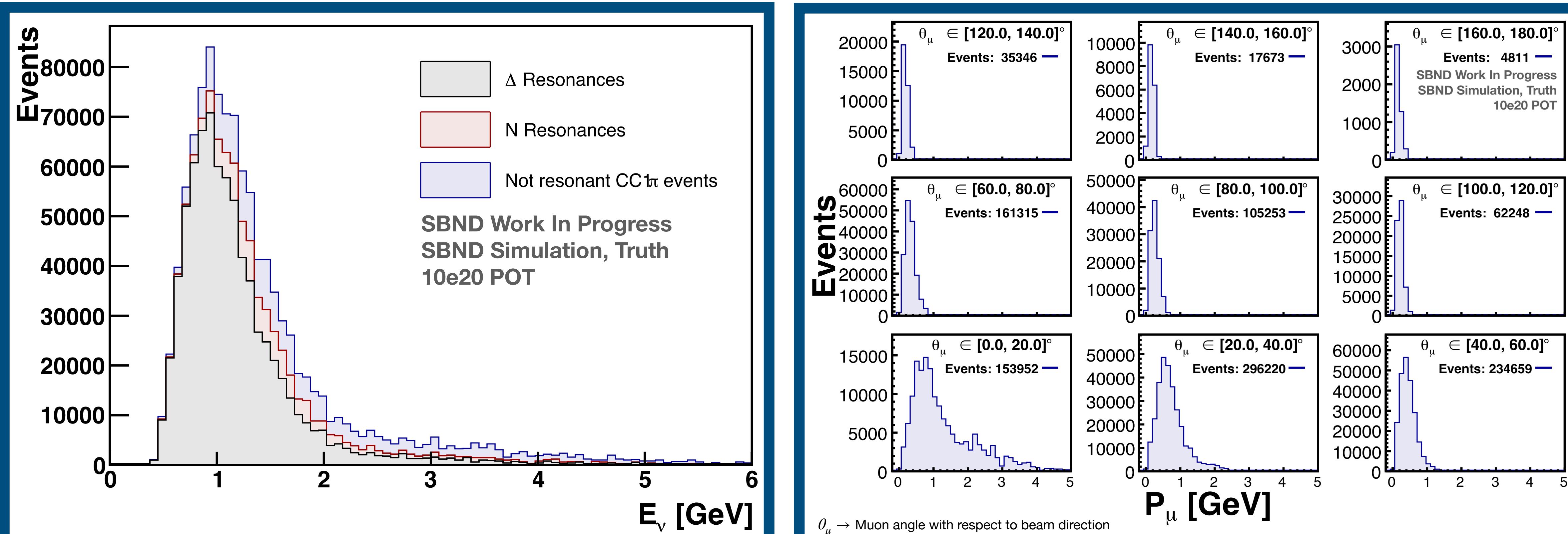
- **NCC1 π** : Only charged particles are the μ and π
- **Δ -like CC1 π** : The event contains exactly 1 proton

$$\text{CC1}\pi = 1\mu^\pm + 1\pi^\pm + N_p p + N_n n + X$$

Rich physics program due to proximity to the target:

- High precision measurement of the unoscillated BNB Flux
- Largest neutrino neutrino-argon interactions dataset
- Exclusive and Inclusive **cross-section measurements**
- Beyond Standard Model (BSM) searches of particles produced in the neutrino beam

3 years exposure double differential cross-section capabilities

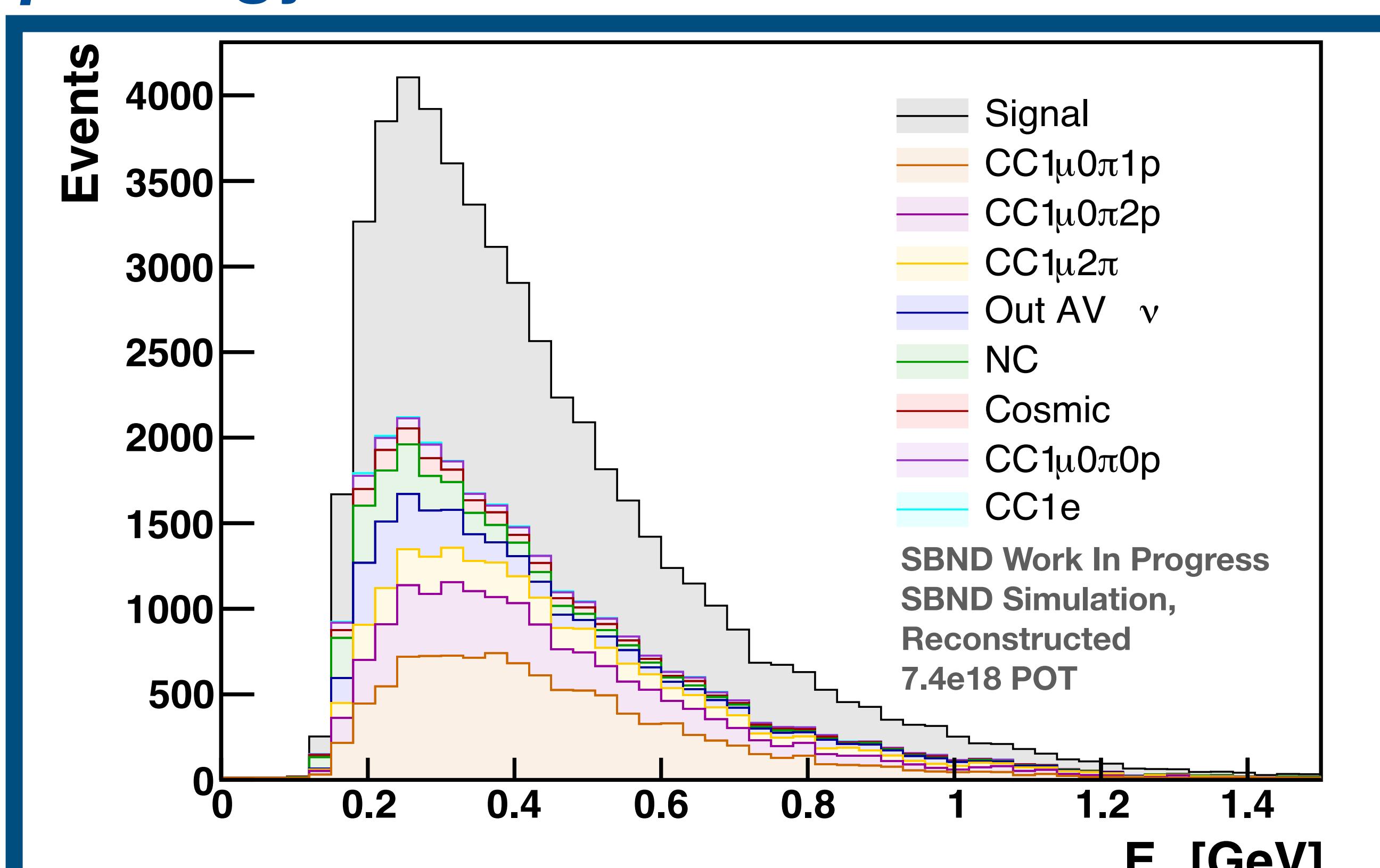


Preliminary reco event selection: 2 months of data

- Using current SBND reconstruction tools a **preliminary selection** is in place
- No cosmic-like events
 - Reconstructed vertex inside Fiducial Volume (FV)
 - More than 1 track
 - 2 particles similar to a muon (*muon-like*)

Cut	Signal	Background	Efficiency	Purity
Initial Sample	72,693	2,135,482	100 %	3.29 %
Cosmic removal	70,154	561,013	96.51 %	11.11 %
Fiducial Volume	52,723	350,142	72.53 %	13.09 %
More than 2 tracks	41,319	144,334	56.84 %	22.26 %
2 muon-like particles	26,695	27,901	36.73 %	48.9%

Preliminary result 2 months of data
27000 events
49% Purity
37% Efficiency



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