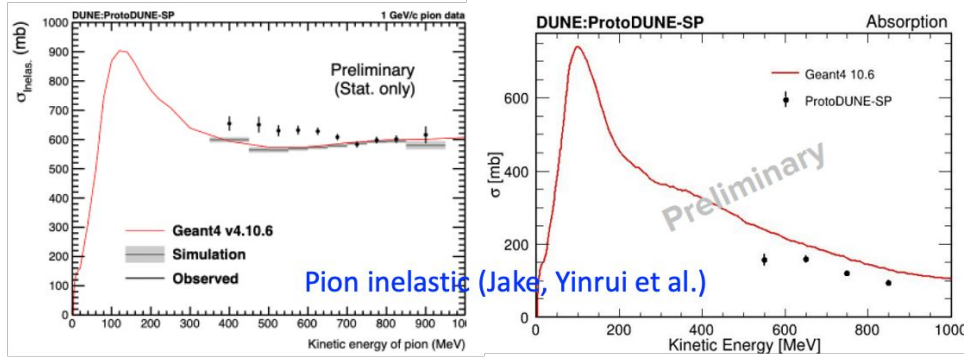


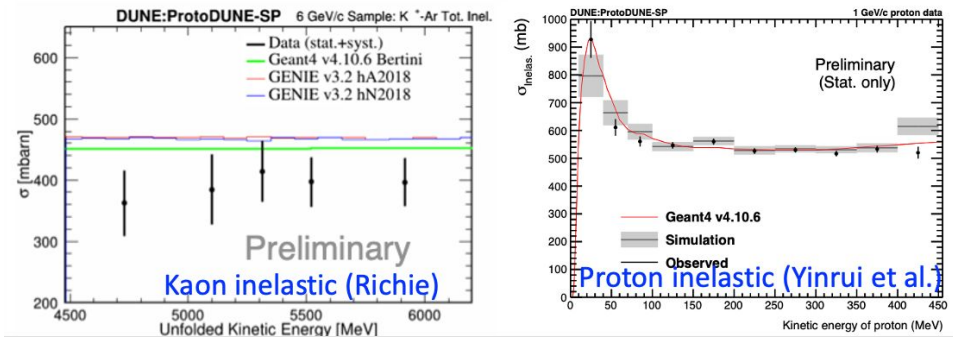
Planning of Beam Request at ProtoDUNE VD

Wenqiang Gu, Laura Zambelli, Leigh Whitehead

Status of hadron analysis in ProtoDUNE SP



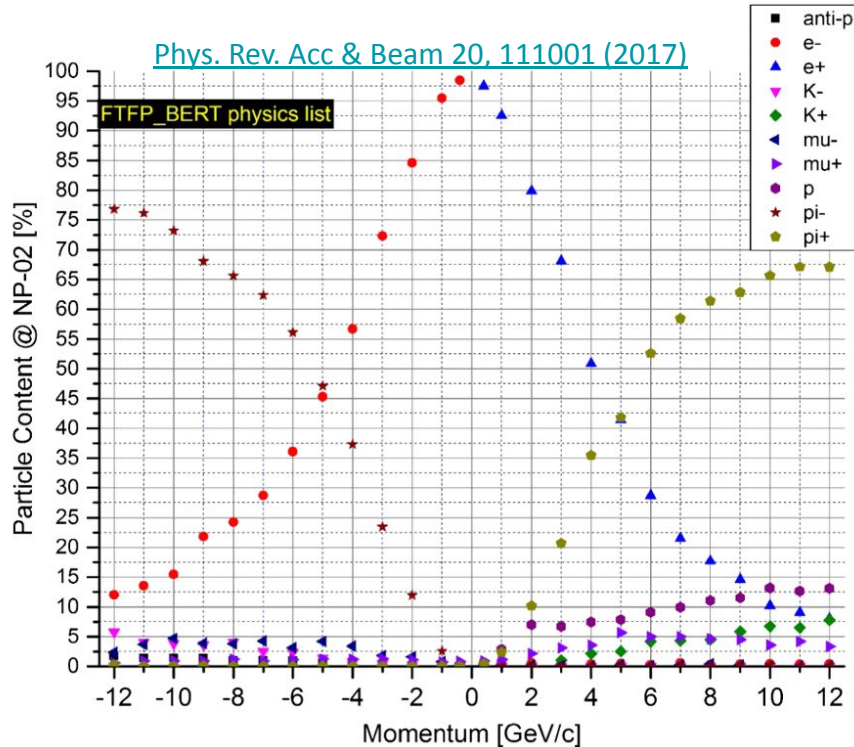
- Except proton inelastic scattering, other analyses have limited sensitivity around the resonance region (low energy)



What can we add at ProtoDUNE VD?

- Hadron-argon xsec at lower energy
 - Beam data with lower momentum would be helpful, however, how much triggers can we have? ProtoDUNE-SP does not have sufficient triggers at 0.5GeV/c
- Redesign the beam trigger logic for low-momentum kaon, say 3GeV/c
- Negative polarity
 - Electron vs. positron: same calorimetry performance?
 - How difficult to switch between negative and positive polarity?
- Tune the charged particle fraction with different target? (Niko et al.)

Beam particle fraction @ NP02



- Although no obvious improvement in hadron fractions for negative polarity, it can still be interesting to understand the systematic difference between electron and positron, pi- and pi+ etc.

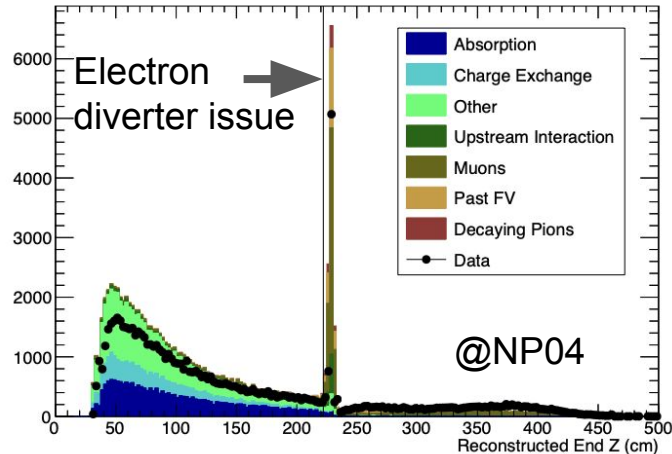
Beam line instrumentation logic @ NP04

		<i>Momentum (GeV/c)</i>			
		1	2	3	6-7
<i>e</i>	TOF (ns)	0, 105	0, 105	—	—
	XCET-L	1	1	1	1
	XCET-H	—	—	1	1
μ / π	TOF (ns)	0, 110	0, 103	—	—
	XCET-L	0	0	0	1
	XCET-H	—	—	1	1
<i>K</i>	TOF (ns)	—	—	—	—
	XCET-L	—	—	0	0
	XCET-H	—	—	0	1
<i>p</i>	TOF (ns)	110, 160	103, 160	—	—
	XCET-L	0	0	0	0
	XCET-H	—	—	0	0

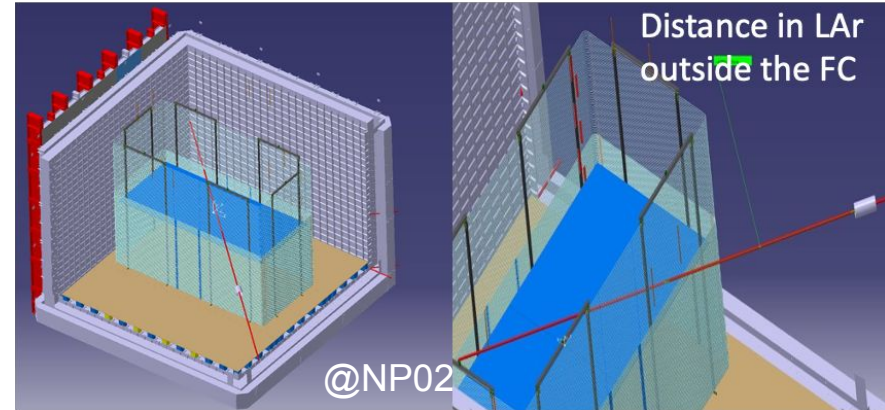
- In ProtoDUNE SP, we did not separate kaon and proton triggers in the 3GeV/c beam data
 - Can we redesign the beam instrumentation logic for kaon at 3GeV/c?
 - Almost no kaon below 3GeV/c

Some thoughts on ProtoDUNE VD

- ProtoDUNE SP's analyses are suffering from broken tracks at $\sim 2.3\text{m}$, ProtoDUNE VD should have more low-energy hits from the $1\text{GeV}/c$ beam data



- With the present ProtoDUNE VD design, the track length within the active volume is about 4.5 m
- The distance from the cryostat membrane to the entering point into the FC is $\sim 4.3\text{m}$



More reading: [beam plug](#) (by Francesco)