Fixing the Unexpected Peaks in Bertini Partial Cross Sections

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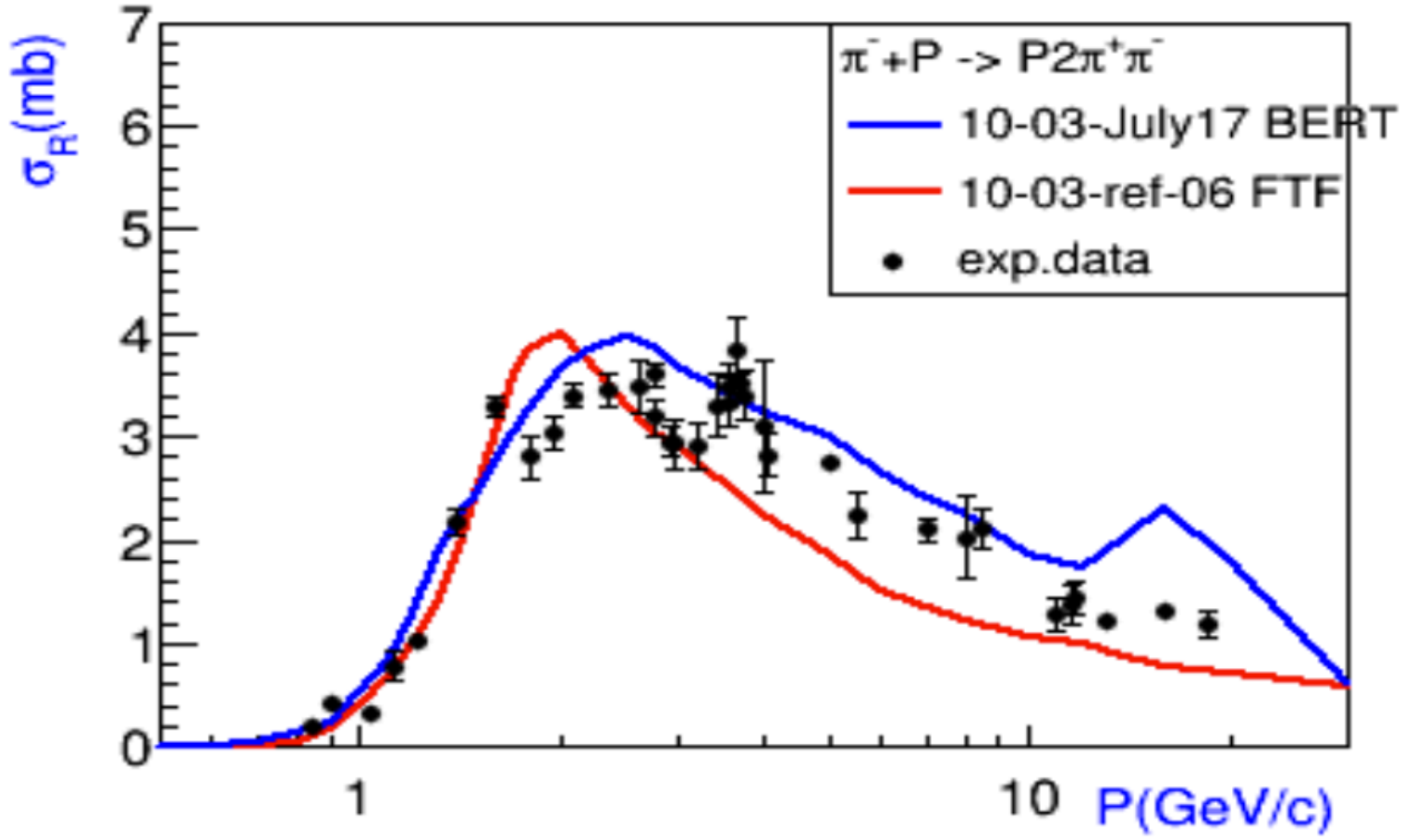
Unexpected Peaks Seen in Bertini

- Vladimir Uzhinsky pointed this out in July
  - looking at reaction cross sections for pi+ p and pi- p



Problem Reproduced and Identified

- Used process-level test to do pi+ p reactions
  - mystery peaks reproduced

- Problem due to insufficient strange partial cross sections above ~5 GeV
  - ignoring strange channels is OK for low energies, but above ~5 GeV, these channels add up to a big fraction of total cross section (21% at 10 GeV, 33% at 15 GeV)

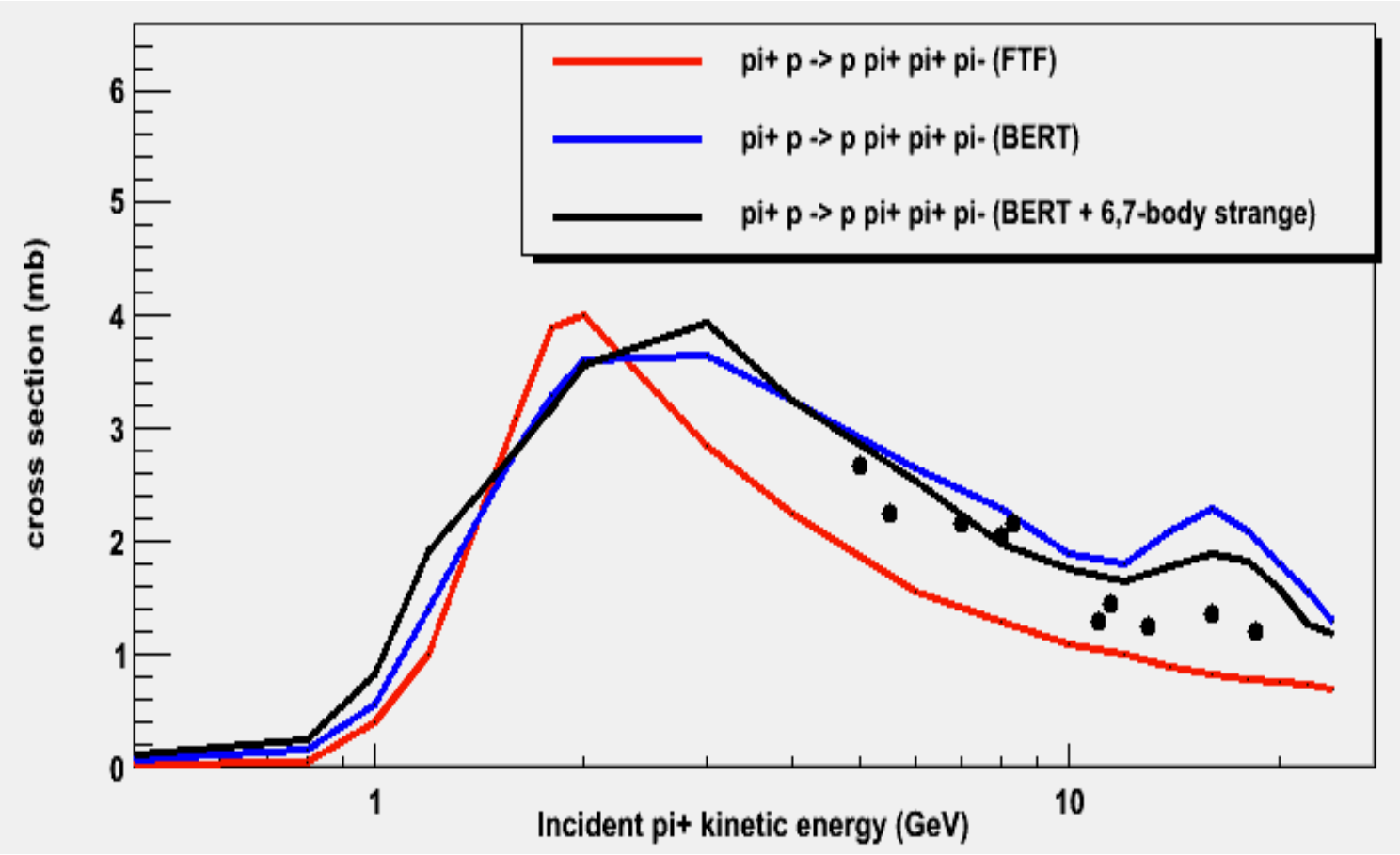
- Bertini code normalizes sum of existing cross sections to total cross section
  - if too few channels, each channel is sampled too often (cause of rising edge of mystery peak)

Partial Fix Ready

- Added strange particle partial cross sections, such as
  - $\pi^+ p \rightarrow \Lambda K^+ \pi^+ \pi^+ \pi^- \pi^0$
  - $\pi^+ p \rightarrow n K^+ K^- \pi^+ \pi^+ \pi^0$
- 28 additional channels for 6-body, 35 for 7-body
- With fix, fewer pions will be produced above ~5 GeV
  - but more kaons, hyperons

Peak is Going Away

- Improvement seen with additional 6- and 7-body channels
  - adding 8- and 9-body strange channels should completely fix the problem



Plan

- Add 8- and 9-body strange channels to π^+ p class in Bertini
  - hope to be ready for 10.4

- Add 6-, 7-, 8-, 9-body strange channels to π^- p
  - probably not ready for 10.4 – takes a long time to do