

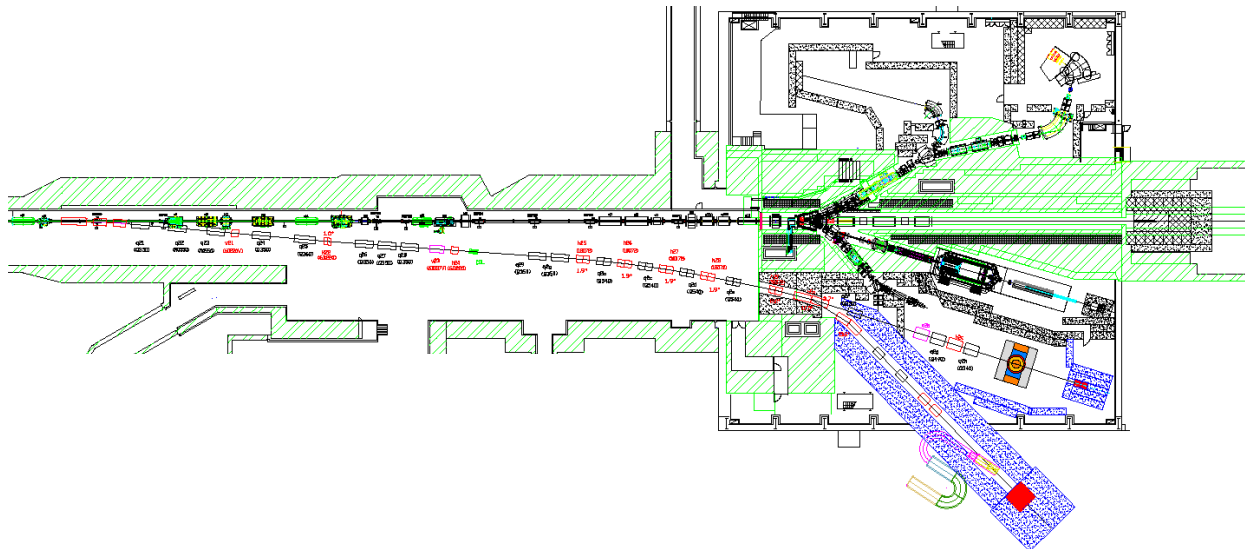
Possible additional hadron physics with J-PARC high-momentum beam

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1) Exclusive hadron production

- Current idea is to study muon-pair production in **inclusive** and **exclusive** Drell-Yan process with pion beam and possibly kaon and antiproton beam using the P50 spectrometer
- Possible by-products of the proposed measurement would include the **exclusive** vector meson production such as

$$\pi^- + p \rightarrow J / \Psi + n \rightarrow \mu^+ + \mu^- + n$$

$$\pi^- + p \rightarrow \phi + n \rightarrow \mu^+ + \mu^- + n$$

1) Exclusive hadron production

- The cross sections for the **exclusive** vector mesons production are expected to be much larger than the exclusive Drell-Yan, since they proceed via strong interaction

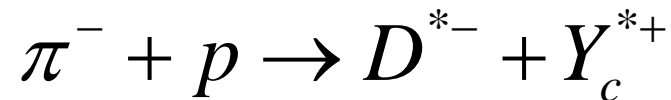
$$\pi^- + p \rightarrow J / \Psi + n \rightarrow \mu^+ + \mu^- + n$$

$$\pi^- + p \rightarrow \phi + n \rightarrow \mu^+ + \mu^- + n$$

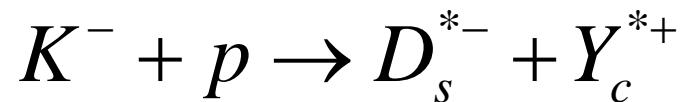
- These exclusive reactions might be sensitive to the strange-quark and charm-quark components in pions and protons, especially near the threshold energies.
- They might also be sensitive to various GPDs.

2) Hadron spectroscopy with high-momentum beams

- The P50 experiment will study charm baryon with pion beam using inclusive reactions. The exclusive reaction can also be measured as a byproduct, such as



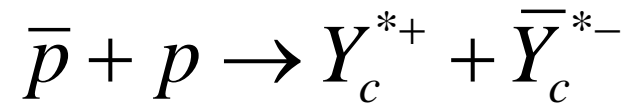
- With kaon beam, one might also consider



where Y_c^{*+} contains c and s quarks

2) Hadron spectroscopy with high-momentum beams

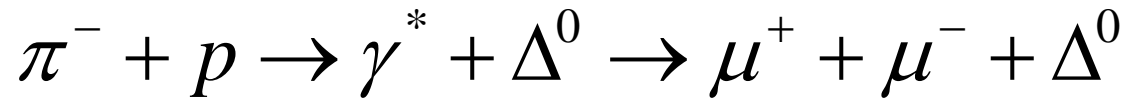
- With antiproton beam, one could consider other interesting exclusive reactions, such as



- The design of the second beams should consider the possibility to provide reasonable flux for kaon or antiproton beams.

3) Other exclusive Drell-Yan reactions

- Using pion beam, one might search for the exclusive reaction:



- Using kaon beam, one might search for the exclusive reaction:



and



3) Other exclusive Drell-Yan reactions

- Using antiproton beam, one might search for the exclusive reactions:

$$\bar{p} + p \rightarrow \gamma^* + \gamma^* \rightarrow \mu^+ + \mu^- + \mu^+ + \mu^-$$

$$\bar{p} + p \rightarrow \gamma + \gamma^* \rightarrow \mu^+ + \mu^- + \gamma$$

These reactions are complementary to the DVCS reactions to be studied at JLab