Internal jeopardy review for PAC48: Run Group K

June 9, 2020

General Comments

The document is in reasonable shape. Some strengthening of the introduction is in order. The main driver of the run group was the hybrid baryon search – does one want to highlight that with the LHCb pentaquark, the understanding of exotic baryons is again a hot topic? Measuring transition form factors from kaon electroproduction is a complementary activity to this.

We have added a statement to connect our study of exotics to their study of exotics.

It would be good to highlight was DVCS at lower beam energies is required to achieve the goals described, besides being possible in the experimental configuration. I.e. why is the DVCS measurement at 11 GeV (mentioned in the text) not suitable for these studies?

We added an opening paragraph clarifying the role of the low energy data in our analysis strategy.

Specific Issues

1. Fig 1: Nice summary of the progress of the data collection, however the labels are rather small
   The figure has been remade to improve the readability of the labelling.
2. Page 2, para 4: will be employed in this Run Group proposal -> are being employed in this Run Group program
   Done
3. Page 2, para 7, line 3: very remarkable -> remarkable
   Done
4. Page 3, para 2: include a reference to the publication from which figure 2 is presented.
   Done
5. Page 4, para 2, line 4: "a distinctively different Q2 evolution of the hybrid-baryon electrocouplings is expected" – is there a reference for this statement?
   Added reference
6. Fig 3: Why does the missing mass of the K+ not show the Sigma-0 peak, as it does in the plots in fig 4?
   The figure with the electron in the FT has been remade to show both the $K^+\Lambda$ and $K^+\Sigma^0$.
7. Fig 4: The plots are too small to read the detail. Perhaps one plot at four times the (area) size? Consider including only one of fig 4 or fig 3 RHS.
   Remade figure and improved caption
8. Page 7, Section 4.3, line 1: "The fall 2018 RG-K dataset amounts to about 7% of the approved RG-K beam time of 100 PAC days". This is probably true in terms of accumulated charge, but is inconsistent with the earlier request of 88 more PAC days out of the approved 100. Be consistent.
   The statement on the collected statistics has been removed entirely, leaving all mention of percentage of collected data and PAC days for RG-K in the Introduction section.
9. Page 7, Section 4.3: It might be worth elucidating what the factor 20 increase in statistics might help produce in terms of new science that has not been possible previously.
   I have updated this paragraph to make the argument crisper.
10. Page 8, fig 5: define \alpha. Is the symbol well known as beam spin asymmetry?
    The caption has been updated to define alpha.

11. Page 8, last three lines: this is the third version illustrating the fraction of the run completed, now explicitly by accumulated charge. As above, be consistent.
    The numbers given state the charge totals for the data used in the figure, not the full fall 2018 RG-K dataset, but the 17 runs added together at 6.5 GeV and 7.5 GeV. I have updated the figure caption, but the text makes sense to me as written.
12. Page 9, last line before Summary: Is it possible to demonstrate why the full statistics originally approved are required? A plot of projected results?

    It is not clear what is meant by plots of projected results, besides the projected results already presented in the original proposal. The count rates for DVCS are mostly dominated by the Bethe-Heitler part of the amplitude, which is known very accurately from the elastic Dirac and Pauli form factors. At the moment with the available data on hand we can at best reproduce these cross sections, but the accuracy would be limited by the known issues with tracking efficiencies that are still being worked on. We cannot use the current data to make more accurate projections than originally presented.

    The generic reason we need the full statistics to achieve our goals is that we want to explore the highest possible x_B region. Our main approach is based on a dispersive analysis of the amplitude, which requires a model parameterization for e.g. $Im\mathcal{H} = H(x = \xi, \xi, t) with \xi \approx \frac{x_B}{2-x_B}$,

    from which the real part is computed. One of the main contributions to the systematic uncertainties in this approach is the extrapolation to the large ξ region. For instance, if our highest x_B bin is at 0.4 that means our limit in ξ is at ¼, which would force a long extrapolation. If on the other hand our highest x_B bin is around 0.67 in agreement with expectations from the RG-A dataset, then we can cover about half the ξ range.

    We reformulated the closing sentence to clarify that the optimal low-energy dataset should match the high-energy statistics in x_B coverage.