1st Online Physics Analysis Meeting, September 03, 2019

Participants:

Abdeel Akram, Gianluigi Boca, Paul Bühler, Alaa Dbeyssi, Waleed Esmail, Albrecht Gillitzer (chair), Klaus Goetzen, Fritz Herbert Heinsius, Johannes Kellers, Iman Keshk, Ralf Kliemt, Sergey Kononov, Frank Nerling, Klaus Peters, Michael Papenbrock, Marc Pelizaeus, Jenny Regina, James Ritman, Anna Skatchkova, Tobias Stockmanns.

Agenda:

1)	Iman Keshk:	Analysis of $ar{p}p o \phi \phi$
2)	Albrecht Gillitzer:	Analysis of 1.5 GeV/c $\ \bar{p}p ightarrow \phi \phi$
3)	Jenny Regina:	Detector Signature Studies
4)	Ralf Kliemt:	Efficiency Gap Forward

5) Discussion

The focus of the meeting was devoted to acceptance problems observed by Iman in her analysis of the $\bar{p}p \rightarrow \phi\phi$ reaction channel, already reported at the PANDA Collaboration Meeting in June 2019.

1) Iman introduced the physics behind the study of the $\bar{p}p \rightarrow \phi\phi$ reaction channel and mentioned the importance of having finite acceptance over the full phase space as a basis for doing a PWA. She has analyzed the reaction at 1.5 GeV/c and at 2.5 GeV/c with ideal tracking. At both beam momenta the reconstruction efficiency exhibits a dramatic decrease at forward angles. Whereas the generated kaon angular distribution has its maximum at $\cos\theta = 1$, the reconstructed distribution has a sharp drop at $\cos\theta = 0.96$ (~15°), and furtheron almost no reconstruction efficiency below 5°. She has compared different PandaRoot versions (dec17p2, dec18p1, ftsmultikalmanfix) and different detector setups (Phase-1, Full) with the result that the acceptance hole at small forward angles was unaffected, although the overall efficiency increased from 9% in the previous versions to 14% in ftsmultikalmanfix due to removal of a bug in the MVD geometry having been present in the previous versions.

2) Albrecht reported on a follow-up study of the same reaction channel, motivated by Iman's report at the June meeting. The analysis was done at 1.5 GeV/c \bar{p} momentum, and in contrast to Iman's analysis, based on realistic pattern recognition, an isotropic ϕ angular distribution in the center-ofmass frame, reconstruction of the final state based on the DecayTreeFitter, and older PandaRoot versions (30122, 30127). He also reported on severe acceptance holes for ϕ 's emitted forwardbackward in the cm frame. He also saw a reduced acceptance for kaons emitted at polar angles below 15°, but he concluded that the dominant problem was the lack of reconstruction of slow kaons with momenta below 0.2 GeV/c, being the daughter particles of ϕ 's emitted at large backward angles in the cm frame.

3) Jenny reported on studies of hyperon reconstruction at the detector hit level. She compared different functors for the track reconstructability together with the Ideal Track Finder. She emphasized that studying hit patterns and illumination plots allows a deeper understanding of the reaction topologies and the tracking performance. In addition, such studies are very useful to find mistakes in both PandaRoot (e.g. wrong geometry implementation) and the own analysis code.

4) Ralf explained the status of the tracking software implemented in PandaRoot and the different options the user can select. Then he showed results of his own analysis based on Box Generator generated events for kaons with momenta in the range of 0 - 0.9 GeV/c and polar angles in the range of $0 - 25^{\circ}$, which he had done related to the reported acceptance problems at small forward angles. He compared four different cases – latest PandaRoot release with realistic pattern recognition, the same with ideal pattern recognition, dec17p2, and day-1 option. In none of the above settings he could confirm the dramatic acceptance drop seen by Iman. In the discussion directly to the talk, it was

however already pointed out that one should not directly compare the two observations, since Iman had seen the acceptance hole in the reconstruction of the full physical final state whereas Ralf had shown kaon single track efficiencies.

5) Discussion

Directly after each of the presentations questions to the respective content were discussed. After the last presentation only a very brief more general discussion took place. It was pointed out that one should be careful comparing results not taken at identical conditions. The reconstruction efficiency in the Forward Spectrometer, and also in the most forward part of the Target Spectrometer need to be further studied, and the understanding is that there are still options to improve it. In contrast, the lack of reconstructability of very low momentum kaons is a principle limitation which cannot be overcome by improvements in the tracking software.

A follow-up meeting is planned for the first week of October which will then be the last one before the PANDA Collaboration Meeting in November.