Summary of online physics analysis meeting, October 1, 2019

Four presentations were given during the meeting focusing on 1) follow-up of the acceptance hole studies for kaons (see last meeting) by Tobias Stockmanns and Albrecht Gillitzer; 2) status report of the analysis of complex channel involving seven photons by Aron Kripko; 3) report on feasibility studies in the glueball sector and plans by Keval Gandhi. Below an executive summary of the talks and related discussions. All the documents including presentations can be found on

https://panda-wiki.gsi.de/foswiki/bin/view/Physics/OnlinePhysicsForum

Tobias Stockmanns, Kaon reconstruction studies in PandaRoot

Tobias presented a "hit" analysis of forward going charged kaons and low-momentum kaons within acceptance of PANDA. Note that this analysis did not involve any "high-level" reconstruction of tracks, but concentrates on a study of the hits in various detectors. At very forward angles and for kaons with high momenta (0.4-0.8 GeV/c), the "primary" (more than 4 hits) efficiency drops to about 40%. The loss can be traced back to decaying kaons not reaching the sensitive detectors. For momenta between 0.1-0.2 GeV/c in a scattering range from 10-175 degrees, a large fraction of events suffer from a low hit multiplicity causing significant drop in efficiency. In conclusion, it appears that earlier observed acceptance holes in the phi-phi channel are not due to the high-level reconstruction software, but dominantly related to the detector design and the related decay of kaons leaving only small or negligible number of hits in the detector at the extremes in low scattering angles and low momenta.

Albrecht Gillitzer, Follow-up study on ppbar->phi phi channel

Albrecht performed a follow-up analysis of his earlier report on the ppbar->phi phi channel. In the case the two phi mesons are reconstructed via their charged kaon decay, he found that there is a high probability to find that at least two kaons suffer from an efficiency loss due to the same reasons as pointed out by Tobias. He proposed to study the process for which one of the phi's decays into KL KS. The KS can be fully reconstructed via its pi+pi- decay. The KL will, with a high probability, leave a signature in the calorimeter. Its kinematics can be reconstructed via a missing momentum reconstruction. The feasibility of this decay looks very promising and will resolve the acceptance holes. The question that needs to be addressed is whether the background can be suppresses sufficiently via the proposed decay.

Aron Kripko, Analyzing a complex decay channel by using genetic algorithm

Aron gave a status report on the study of a key physics channel (ppbar->eta \tilde{etac1}) that involves a complex decay involving seven photons and an electron-positron pair in the final state. For optimizing the cuts (12 parameters), thereby the statistical significance/signal-to-background ratio, a genetic algorithm is being used based on earlier work by Christian Will. This method

shows some good perspectives. Aron did point out a problem related to the detection efficiency of the photon reconstruction, which appears to be low (63% including conversion per primary photon). For the future, he will look into a channel with a simpler topology to sort out the deficiencies he observed. For a better understanding of the photon reconstruction, it was proposed to look into the reconstruction efficiency of single pi0's and to determine the efficiency within the acceptance of the calorimeter.

Keval Gandhi, Feasibility study of f0(1500,1700)->pipi/KK in PandaRoot

Keval presented the first results of their analysis of the f0(1500,1700) decays into pions (kaons) using PandaRoot. As primary quality spectrum, he studied the invariant mass response of the pions (kaons). For the future, he proposes to study the feasibility to measure the branching fractions of the D2(2460). During the discussion the following recommendations were made: 1) focus on the feasibility of one channel, preferably in the light-meson/glueball sector since that will be suited for phase-one of PANDA. Eventually one has to demonstrate the performance via a full PWA with background etc..; 2) use a different production process in which the f0(1500,1700) are produced with a recoiling pion instead of a photon; 3) study also other, more basic, spectra such as the angles/momenta of the final-state pions and kaons and corresponding hit patterns (similar to what is done for phi phi study); 4) consult regularly the experts within the physics working group or other who have lots of experience in physics analysis and software.

The next online meeting will take place on Tuesday, December 3. The time of the meeting will be moved to 14:00. The topic for that meeting will be dedicated to ongoing EMFF studies.

Johan Messchendorp.