Notes on LiH scattering analysis
2021-03-26
15:30 GMT.

Dan: I am confused about the TOF corrections. Could you explain again. John Nugent: the MC recon-MC truth of the pz at the centre of the absorber was not consistent. Dan: are you estimating the momentum from TOF01 and TOF12 using pure MC and correcting the data John: yes Dan: I hope you explain it correctly.

Dan: slide 34 – it is interesting that the data has significant downward fluctuations at the peaks. John: the MC is statistically limited. Dan: the momentum distribution is not necessarily Gaussian Chris: this is momentum after the TOF cut. Ken: it looks like the shape in the data is not the same as the shape in the MC. Paul: maybe the data is a tad wider. Dan: I hope the analysis is not sensitive to this. Chris: the analysis has shifted the distribution by about a third of a bin width in TOF to estimate systematics.

Daniel: the error bars are larger where there is more data. Why is that? John: It is relative error vs absolute error. Daniel: okay. John: the bin size is about 10 MeV/c and the resolution is about 3 MeV/c. John C: note that John N has promised to make distributions of the true momenta. Ken: the width is well determined and the shape.

Dan: Slide 36 should the correction be bigger in X or Y? John: it is correct.

Dan: slide 38 the data is showing less data in the tails (out to 45 mrad). John: the errors are quite large due to statistics. Dan: the efficiency is high. John: the statistic is low. Dan: can we see a linear scale with the tails showing. Chris: slide 62 shows the tails. Ken: it's unfortunate that we didn't have enough data in the tails. John C: where do the error bars on Moliere come from. John: it is an error, I will fix it. Chris: did you include updated Moliere? John: no, Moliere has been updated with some new constants. John C: there is an ambiguity in Fano's correction to Moliere. There is a term with confusing sign. Muscat data for Hydrogen favours greatly the calculation shown in these slides. MICE and Geant4 favours Moliere with the opposite sign. I have not cross-checked the central momentum which is a bit different and the momentum spread in the beam. I need the true momentum distribution to do that comparison. Dan: Alvin Tollestrup convinced us that Moliere should not work for Hydrogen. John C: raw Moliere should not work for Hydrogen due to electrons. Fano correction includes corrections for electrons – kinematic limit (4 mrad) and inelastic scattering correction which has u_{in} term, not sure on sign of u_{in}. Chris: Geant4 prefers MICE data. John C: errors come from statistical limit of G4. Ken: could make an error in Moliere and see if it reflects the Geant data. Dan: what version of Geant? John: it is written down in the paper. Dan: is that after the MuScat correction? Paul: yes. John: it uses Urban for pions and Wentzel for muons. Paul: no it doesn't. Ken: pions should not be the same as muons Paul: correct we are talking about EM scattering only.

John C: Slide 40 the deconvolved distributions are not symmetric. John: the alignment correction is causing asymmetry. Dan: do you make the same correction between empty and full? John: no I do a different alignment. Dan: how well do you do the correction? John: it is fine. Dan: what is the systematic uncertainty? Paul: it is negligible. John C: I am confused by Slide 40. John: I don't force them to be symmetric. I don't look at the bins > 45 where they are misaligned. Dan: I would like to see the distributions overlaid. John C: I can't remember if I can see that distribution unfolded. John: getting on to factor 5. Dan: the truth looks symmetric. The data looks asymmetric. John C: the systematic looks very asymmetric. John: yes this is because there is no data in the empty. Dan: should we use wider bins at larger angles. John: I don't know if that works with Gold. Ken: 45 mrad is a pragmatic compromise. Dan: why not use MC for deconvolution. Chris: Slide 40 is pure MC –

so there is no point in using MC to do the MC. John: yes it was pure MC. John C: the deconvolution procedure is asymmetric. John: the tail bins have a big effect on the deconvolution. Ken: you can force the distribution to be symmetric. John: toy MC (with high stats) does give a symmetric distribution. John C: we can't do the deconvolution then. Chris: we have systematic uncertainty. Dan: I have serious misgivings. John: the underlying distributions are symmetric Henry: what would the asymmetry mean? Chris: parity is violated in EM interaction. It is not physical. Dan: it may not be significant below 45 mrad. Chris: slide 63 shows an asymmetry.

Ken: We can do it in parallel to reviewing the paper. Paul: could force the empty distribution to be symmetric. Ken: that sounds like a good idea.

Chris: propose we do a special video conference.