Indico: https://indico.cern.ch/event/1013724/

Agenda:
- Interaction Vertex Multiplicity Study: Beam and Daughter Momenta_ - Stefano Vergani
- Comparing Raw Data and Reconstructed Values_ - Fatma Boran, Furkan Dolek

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- **Interaction Vertex Multiplicity Study: Beam and Daughter Momenta_ - Stefano Vergani**

Pileup with SCE, can't get information about length-- mentioned previously. Either non physical (negative) or info not there. Not present w/o SCE.

LW: Didn't think much in projection of resolution. Majority of particles are interacting before they come to rest-- momentum by range is not something that makes sense. Exception was ?? because stopped and decayed to Michels
FS: energy loss along track segments, and how that compares between MC and truth
        => We need to think of the best way to characterize this kind of resolution we want which is most useful to us. Something along the lines of track segments and track checking, and loss/resolution in different regions of the track.

KM: P6 why the drop off in energy? No higher momentum tracks. LW: Reconstruction efficiency and some of those particles interacting. Maybe re-interactions are more probable at HE? I don't know if we have the information where the primary beam interacts in the truth, then it may make sense if we do have that.

KM: Are there any checks for if SCE and without? SV: I don't have plots, and looking at it before, it was similar. Only differences was this, where track length issues to consider. LW: Same events reconstructed-- SCE is correction or not. Application of SCE MC for all of it-- red shows the correction. Correction did something odd.

- **Comparing Raw Data and Reconstructed Values_ - Fatma Boran, Furkan Dolek**
Issue on Wire 480, between two APAs

FS: p10, need to keep on this work-- easy by eye to see the vertex here.

KM: How often is the interaction point before the beam
FD: Maybe next step for us, is to check absorption events. FS: Beam particle must interact before or right when entering-- by eye can see it, but it's understandable that a reco algorithm in the beam window and angle will identify the daughter as beam particle.
KM: Can we do this with MC? To see if there are major differences in data and MC with a check like this? JC: We can do it in data because we have the info saved, but what's available for analysers, we don't have it. FS: Can we use ID in reco and true? To know if it's a daughter picked by pandora as beam particle? JC: If we want to identify upstream interaction before TPC? Could do that.

JC: Upstream events are a subset of all of these studies-- wouldn't be the same study doing here. Could do something similar-- look at true end position of the beam particle and then we now have in ntuple to modify what that would be under SCE effect. Move it to a position and compare to reconstructed end position here.

TJ: We do need some automatic which we can histogram. We should compare variables which have some relation to how often these failures happen. A track isolation variable, or a # of delta ray candidates-- for example-- how often spit off sides of tracks which don't cause the track. We don't know if proton or delta ray-- rate is different in data/MC. And also charge uniformity-- a step in charge in data vs. MC.
LW: Look at how often exceed from residual range-- problems in data in gap between two TPCs for doing that.
TJ: Simulation should be better, but it is not perfect. Given that there is a gap, tracks are broken and they don't tell you what you want to know. LW: For muons, does reach into 2nd TPC.

JC: Saw a long time ago, interesting failure mode-- particles interacting or crossing cosmic-- reconstruction can skip a handful of wires (a dozen). One continuous track, won't include that in there. Seeing how often that happens, could be a way to have something similar.
TJ: Separate parameters from interest from uncertainties. If the cross section is different -- getting wrong point, and some of it is what you want to measure. Sometimes, we want to correct for them… and sometimes you want to publish as the measurement!

KM: Are there things the reco folks would like to see from this work? LW: if we can define something to do with the failure modes. We have the beam trigger, we can use a random trigger, pseudo efficiency. Beyond that, we have to be more subtle about what we are trying to see.

> => What failures are we most worried about?
> => Can we define suitable variables we can use for these checks?

TJ: Things which almost fail, but succeed which we can test the rate of.
- Kinks of tracks which are barely detectable but which are detectable, can see the rate. Daughter and parent histogram angle if it's modelled well for small angles.

FS: I was going to suggest to look at 100 absorption events, and a plot like this one, for selected CEX. Do we have the same kinds of failures coming in?

JC: Not exactly related to what is shown here, could we look at efficiency to reconstruct vertex-- look at MC. Vary SCE or vary cross section model, and see if efficiency changes. Then, that's where the systematic could sneak in. KM: I"m concerned we haven't done simulated SCE spatial distortions, alignment issues?
JC: We have done some SCE, Production team will also include Tom's work-- eating charge-- can compare efficiency and the nominal SCE sample. KM: Tie in is the suitable variables JC: yes-- and then we need to be specific for this analysis.

> => Furkan and Fatma to look at 150 absorbed events (like what was done for charge exchange)

Next meeting the 23rd March