Meeting Notes from PID WG

1. The PID lookup mechanism is a temporary patch, while the long-term goal is the job of developing a full PID reconstruction as part of EICrecon. **The goal of the PID lookup mechanism is to provide a first order approximation to make possible the usage of PID information in the analysis and physics studies in the short-term perspective.**
2. **The PID lookup mechanism will be integrated in EICrecon. The respective 'factory' and data structures are already or will be made available by the S&C group.**
3. The S&C group will create an example for the DSCs to guide their specific efforts
4. The PID info is to be created as a function of the following kinematic variables: p (GeV), η, φ (rad), q; with q either +1 or -1 depending on the charge of the particle. The variables are defined at the vertex.
    a. Comment: To define the kinematics at the vertex is easier to implement than at the entry point to the PID system. One would need additional xyz positions to implement the η,φ dependence.
5. The particles range to cover are: π, K, p, e, null; here 'null' means that no PID information is available; this is rather implementation specific and the easiest approach should be chosen by the implementer.
    a. Comment: It was confirmed in the PID meeting of Mar. 1 that muons are left out.
6. The DSCs have to provide weights/probabilities of the form: $P_i^j(p, \eta, \varphi, q)$ where i is the generated particle type (π, K, p, e, μ) and j is the hypothesis where j is one of π, K, p, e, μ of course.
    a. Comments: as of now, the P is meant as a normalized probability, meaning Sum_over_j(P_i^j) = 1
    b. Comments: Further details to be given by the PID system. Any algorithm needs to be based on the detailed information of the detector system.
7. We will have to generate a random number according to the given Ps for a given i to make the final decision. This should be integrated into EICrecon.
8. A decision quality parameter was suggested to be provided along the PID result. While easily envisioned it is not at all straightforward to do in a statistically meaningful way. Possible addition at a later point.

Additional Points from the Follow-Up Discussion

Format Decision: The format for the PID look up tables, involving listing normalized probabilities as functions of momentum, pseudorapidity, azimuthal angle, and charge, has been defined, as reflected in the meeting minutes above.

For the initial implementation, please provide the LUTs in a tab-separated ASCII file.

Binning Flexibility: Each PID subsystem chooses the binning for each variable to suit the performance and needs of their specific subsystem. There is no one-size-fits-all binning across subsystems.

Sample Template and Implementations: I will provide the initial implementations for the four PID systems. Apart from the binning, this will be identical for the subsystems. The LUTs will be input files (external resources).