Status of YR DWG Calorimetry

The YR Calorimetry Working Group has considered several technologies used for electromagnetic (ECAL) and hadron calorimeters (HCAL) and evaluated their applicability for the EIC project. The conclusion is that the requirements for the energy resolution can be met, or nearly met. A limitation comes from the space allocated for the calorimeters. A layout of the spectrometer from the presentation by M. Breitfeller at Temple meeting was taken for guidance. In that design the hadron arm has ΔZ=87 cm allocated for HCAL and 38 cm for ECAL. The electron arm is the same, though there is no obvious obstacle for an 20-40 cm extension toward the center of the magnet. The barrel calorimeter depends on the magnet design. For the BaBar magnet the outer diameter of ECAL can go up to 140 cm, while the minimal radial thickness of ECAL is about 30 cm (based on the sPHENIX experience). The technologies that can provide the needed resolutions, and can be applied, are:

- Endcap ECAL $\Delta Z < 38$ cm: $PbWO_4$ crystals (developed technology), W powder+ scint. fibers (developed), W/Sc shashlyk (doable)
- Endcap ECAL $\Delta Z < 50$ cm: Scintillating glass (under development), Pb/Sc shashlyk (developed)
- Barrel ECAL $\Delta R < 30$ cm: W powder + sc. fibers (developed)
- Endcap HCAL $\Delta Z < 105$ cm, Barrel HCAL: Fe/Sc. (developed)

Apart of the energy resolution the group has specified other characteristics of the proposed system, as the spacial resolution and e/π separation. The latter was discussed with the PID DWG and with physics groups. It was concluded that other detectors may be needed to provide an additional e/π separation at energies $<$3 GeV. The single photon versus π^0 separation has been discussed.

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Remaining action items:

- Help to build a GEANT model of the setup and use GEANT simulation for more realistic detector evaluation:
  - Evaluate the impact of the material in front of the calorimeters on their characteristics, in particular on the e/π separation.
  - Evaluate the detector performance in the area close to the boundary between the barrel and the endcap, where cables from the inner detectors are supposed to leave the inner part of the spectrometer.
- Find out the requirements on the single photons versus π^0 separation. The ECAL granularity depends on this requirement. The requirement on the cell size would affect the choice of the detector technology.
- Evaluate the cost/benefit for a projective geometry
- Elaborate on the choice of optical sensors and the requirements to readout electronics.