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Optimizing the Calorimeter Design for sPHENIX

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The PHENIX collaboration has proposed a major upgrade of the exisiting experiment at the Relativistic Heavy Ion Collider for the 2020-2022 time frame. The new experiment, code-named "sPHENIX", is built around the former BaBar magnet, and consists of tracking systems and 3 calorimeters: an electromagnetic calorimeter based on scintillating fibers embedded in a tungsten-expoxy matrix, and two steel-scintillator hadronic calorimeters, one inside the magnetic field, and one outside. The BaBar magnet has an inner diameter of 280cm and a length of 385cm, which translates into a pseudorapidity coverage of $|\eta| < 1.0$ and a most extreme angle of incidence of 65° with respect to a vector pointing straight to the beam line. Starting from an optimally projective design with double-tapered EmCal modules, which are extremely challenging to produce, we present studies of various tilted calorimeter designs to find the best tradeoff between the uniformity of the sampling fraction, avoidance of "channeling" paths for particles, and project costs. We will show the results from simulations exploring the parameters governing the achievable energy resolutions and the detector complexity for the three calorimeters.

On behalf of collaboration:

PHENIX

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