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Status and Performance of the Calorimeter Systems for the sPHENIX Experiment at RHIC.

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Abstract

The sPHENIX experiment at RHIC will make high statistics measurements of jets, jet correlations, and upsilon states in heavy ion collisions in the early 2020's. High resolution tracking coupled with uniform electromagnetic and hadronic calorimetry will be used to characterize the temperature dependence of transport coefficients of the quark-gluon plasma.

In this talk we will present a brief introduction to the sPHENIX detector design with emphasis on calorimetry. The latter includes a compact tungsten/scintillating fiber electromagnetic calorimeter and two steel/scintillating tile hadronic calorimeters (sections).,The outer one also serves as a field return yoke to the central magnet. The design is optimized for jet energy measurements above the underlying event background in Au-Au collisions at RHIC energies, electron and photon identification, and measurement over the entire range of secondary particle momenta, including those from W/Z-decays and photon/π0 separation at transverse momenta critical for precision measurements of the thermal photon emission from the early stages in heavy ion collisions. Constrained by the preexisting BaBar superconducting magnet, we have chosen for sPHENIX a relatively thin (~5Labs) hadronic calorimeter segmented longitudinally into two parts with towers in each longitudinal section overlapping in azimuth and rapidity. With the hadronic calorimeter split into Inner (inside the magnet) and Outer (outside the magnet) sections, we improved electron identification in the experiment and reduced the overall cost of the experiment.

Prototypes of the sPHENIX calorimeter system have been extensively simulated within the GEANT4 simulation framework and repeatedly tested in particle beams in the T1044 test beam at the FTBF at FNAL. Both simulation data and test beam data will be reported in this talk