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QCD Test in Three Jet Z^0 Decays at SLD and Detector Development for $H^0 \rightarrow$ Gamma Gamma Searches in High Energy Hadron Colliders [*]

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QCD TEST IN THREE-JET Z^0 DECAYS AT SLD AND DETECTOR DEVELOPMENT FOR $H^0 \rightarrow \gamma\gamma$ SEARCHES IN HIGH ENERGY HADRON COLLIDERS

by

HYUN HWANG

A DISSERTATION

Presented to the Department of Physics
and the Graduate School of the University of Oregon
in partial fulfillment of the requirements
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"QCD Test in Three-Jet Z^0 Decays at SLD and Detector Development for $H^0 \rightarrow \gamma\gamma$ Searches in High Energy Hadron Colliders," a dissertation prepared by Hyun Hwang in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Department of Physics. This dissertation has been approved and accepted by:

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August 30, 1994

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Title: QCD TEST IN THREE-JET Z^0 DECAYS AT SLD AND DETECTOR DEVELOPMENT FOR $H^0 \rightarrow \gamma\gamma$ SEARCHES IN HIGH ENERGY HADRON COLLIDERS

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Polarized Z^0 decays into three jets have been detected and measured in the SLD (SLAC Large Detector) experiment at the Stanford Linear Accelerator Center (SLAC). The hadrons from the jets were detected in the SLD liquid argon calorimeter, providing a sensitivity over 98% of the solid angle. The spin of the gluon was tested by studying the scaled jet energies (x_1, x_2, x_3), the Ellis-Karliner angle ($cos\theta_{EK}$) and the parameters of event plane orientation (α, α_N, χ). These measured variables are compared with quantum chromodynamics (QCD) and a scalar gluon model. Good agreement is found between data and the vector QCD model for the distributions of x_1, x_2, x_3 and $cos\theta_{EK}$.

Two detector prototypes for the GEM detector of the Superconducting Super Collider have been studied: a prototype silicon-tungsten preradiator and a liquid

argon hadron calorimeter. The silicon-tungsten preradiator was designed for the GEM detector to distinguish between single photons from Higgs decay and background photon pairs from π^0 decay. This preradiator was tested in a beam at Brookhaven National Laboratory in July, 1992. A lead glass array placed behind the silicon was used to determine energy resolution effects. The results from the test on spatial distributions and energy resolution3, including correction for the energy deposited in the preradiator are presented, along with comparisons to EGS simulations. Data from a beam test of the liquid argon prototype was analyzed and compared to CALOR89 simulations. The studies concentrated on energy resolution optimization and electronic noise suppression.

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PUBLICATIONS:

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