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**Analysis of the Laser Calibration System for the CMS HCAL at CERN's Large Hadron Collider** LUIS LEBOLO, VANESSA GAULTNEY, LAIRD KRAMER, STEPHAN LINN, PETE MARKOWITZ, FIU, FLORIDA INTERNATIONAL UNIVERSITY PHYSICS DEPARTMENT - USCMS TEAM — The European Organization for Nuclear Physics' (CERN) Large Hadron Collider uses the Compact Muon Solenoid (CMS) detector to measure collision products from proton-proton interactions. CMS uses a hadron calorimeter (HCAL) to measure the energy and position of quarks and gluons by reconstructing their hadronic decay products. An essential component of the detector is the calibration system, which was evaluated in terms of its misalignment, linearity, and resolution. In order to analyze the data, the authors created scripts in ROOT 5.02/00 and C++. The authors also used Mathematica® 5.1 to perform complex mathematics and AutoCAD® 2006 to produce optical ray traces. The misalignment of the optical components was found to be satisfactory; the Hybrid Photodiodes (HPDs) were confirmed to be linear; the *constant*, *noise* and *stochastic* contributions to its resolution were analyzed; and the quantum efficiency of most HPDs was determined to be approximately 40%. With a better understanding of the laser calibration system, one can further understand and improve the HCAL.

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