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Design of precision Luminometer for future linear e+e- colliders ILC and CLIC.

This paper describes the status of the design of the LumiCal calorimeter for precise luminosity measurement for future linear e+e- colliders ILC and CLIC. LumiCal is planned as a compact and highly segmented sandwich calorimeter consisting of tungsten disks of one radiation lenght thickness interspersed with silicon pad sensor planes. It covers the polar angle range of 32 to 74 mrad, and provides measurement of the luminosity based on counting Bhabha events in electron positron interactions at ILC or CLIC . In addition it improves the main detector hermeticity. It should meet the requirement from physics on the precision of the luminosity measurement which is better than 10-3 for the ILC and better than 10-2 for CLIC. Requirements, like the accuracy of the sensors position, the detector position, and the dynamic range of the readout electronics, are discussed in this paper. A laser and capacitive position monitoring system has been built and tested. Tests in the laboratory have demonstrated that it reaches the required precision, about a few micrometers, at short distances. Prototype silicon sensors have been developed for LumiCal, and performance tests in the laboratory have been done. Design of the mechanical structure, fan out, front-end electronics and cooling system for LumiCal is presented. Several aspects of integration with ILD detector are considered.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

LumiCal serves for the precise measurement of the luminosity and improves the detector hermeticity as well. Detailed simulations have been and are being performed
to optimize their design. The most important results of MC studies are presented.
Design of the mechanical structure of LumiCal is presented including discussion on space for front end electronics, fan out on Kapton foil, cooling requirements and necessary stiffness of construction. Thermal expansion of LumiCal structure is also discussed.
To achieve the required accuracy in luminosity measurement, the position of silicon sensors have to be known with micrometer accuracy with respect to the beam and Interaction Point. The inner acceptance radius of LumiCal must be known with the accuracy of 4 μm and we have proved in lab, that our capacitive method of distance to the beam pipe measurement reaches the desired accuracy. Laser beam system for x, y detector displacement has been successfully tested in lab with the accuracy in the submicron range at short distances. The proposed method based on Freq. Scanning Interferometry for distance between two LumiCal's is presented and foreseen to have accuracy better than 50 μm over ˜4 m.
The proposed scheme for front end and readout electronics based on ASIC's is presented. The switched gain of preamplifiers allows us to work in calibration and physics mode. Results of first custom made ASIC's, including pipelined ADC's are also presented.
Prototype silicon sensors have been developed for LumiCal and results of performance tests are presented. Sensors are prepared for LumiCal prototype to be tested on the test beams.
The integration of LumiCal with future ILD detector is discussed mainly focused on fixing the structure inside detector, opening of the detector scenario, cooling issues and space for cables and positioning system.

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