M. S. Ansari, Data acquisition and control system for pulsed laser deposition unit, M. Tech. Thesis, Department of Electrical Engineering, Indian Institute of Technology Bombay, 2000.

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Abstract - The objective of this project was developing a PC based data acquisition and control system for pulsed laser deposition of thin films. The deposition unit is being set up at the Centre for Advanced Technology, Indore, with an aim to develop semiconductor based electro-optical devices. The data acquisition and control unit measures and controls various parameters under which film growth takes place. The measurement block includes an in-situ quartz crystal based film thickness monitoring unit. It utilizes the mass loading effect in oscillating quartz crystals. Difference in the acoustic impedance of the deposited film and the quartz crystal is taken into account while determining 'the film thickness. A water cooled crystal holder and a crystal oscillator with high stability is designed for measurement of the film thickness. Frequency deviation in the quartz oscillator due to mass loading effect is measured by heterodyning principle, by using an external reference oscillator. Other parameters which, are monitored during the deposition process are chamber vacuum, substrate temperature and laser pulse energy. The control system includes drives for two stepper motors, for rotating the target material and to operate a laser blocking shutter. Sensors and stepper motor drives are interfaced to a PC through an add-on card, consisting of analog-to-digital converter, digital-to-analog converter, buffers, analog multiplexers etc. Data to and from the add-on card are optically isolated by isolation amplifiers and opto-couplers, to minimize coupled noise through common ground. Control unit of the pulsed laser used in the deposition process is serially interfaced to the PC.