

DEVELOPMENT OF A
MICROCOMPUTER- CONTROLLED
DATA ACQUISITION SYSTEM FOR
LASER BASED INSTRUMENTS

BY



GATHONI ROBINSON NDEGWA

I56/ 7185/99

**A thesis submitted in partial fulfillment for the
degree of Master of Science of the University of
Nairobi**

November 2002

This is my own work and has not been examined in any other university.

.....

Gathoni Robinson Ndegwa

Department of Physics

University of Nairobi

This thesis has been submitted for examination with my approval as University of Nairobi supervisor

..... 5/12/2002

Dr. Kenneth Amiga Kaduki

Department of Physics

University of Nairobi

ABSTRACT

Laser based instruments are commonplace in research laboratories worldwide but remain fairly expensive and out of reach for the average research/teaching laboratory in developing countries. This work is an attempt to develop a cost effective microcomputer controlled data acquisition system for use in a variety of laser-based instruments. The system has been put together using standard components and is controlled by an inexpensive 8-bit microcomputer.

The system uses a silicon detector to convert an incoming laser beam into a voltage signal, which after conditioning, is digitalized and stored on a 256Kbyte memory bank external to the host BBC microcomputer. The acquired data are available for display and/or further processing by the host. A DMA circuit is implemented to ensure fast transfer of data to and from the external memory. Software routines have been developed to test, initialize and control that system as well as display the acquired data.

A 780nm modulated laser beam has been used to test and calibrate the system. The system's amplitude response has been found, within the modulation limits possible, to be linear for laser power modulation amplitudes lying between 0.75mW to 2.4mW. Modulated laser signals with frequencies between 50Hz and 1.2kHz have also been successively acquired. The data acquisition system should be suitable for use in a variety of laser based teaching and research instruments.