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**THE USE OF LASER DIFFRACTION EFFECT FOR SMALL DIMENSION
MEASUREMENT**

By

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**Research Report submitted in partial fulfillment of
the requirements for the degree of
Bachelor of Applied Science (Physics Electronics and Instrumentation)**

**Department of Physical Sciences
Faculty of Science and Technology
UNIVERSITI MALAYSIA TERENGGANU
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**PENGAKUAN DAN PENGESAHAN LAPORAN
PROJEK PENYELIDIKAN I DAN II**

Adalah ini diakui dan disahkan bahawa laporan penyelidikan bertajuk:

THE USE OF LASER DIFFRACTION EFFECT FOR SMALL DIMENSION MEASUREMENT oleh NUR MASTURA BINTI OTHMAN, no matrik UK 10234 telah diperiksa dan semua pembetulan yang disarankan telah dilakukan. Laporan ini dikemukakan kepada Jabatan Sains Fizik sebagai memenuhi sebahagian daripada keperluan IJAZAH SARJANA MUDA SAINS GUNAAN (FIZIK ELEKTRONIK DAN INSTRUMENTASI), FAKULTI SAINS DAN TEKNOLOGI, UNIVERSITI MALAYSIA TERENGGANU.

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LIST OF ABBREVIATIONS / SYMBOLS

d	-	The slit spacing from center to center
n	-	The number of maxima spots away from the central maxima
λ	-	The wavelength of light
θ	-	The angle between the reference and object beam
y_0	-	The central bright spot
l	-	The distance from object to the projection screen
x	-	The distance from the bright centre spot to one of the dark spots
DPSSFD	-	Diode pumped solid state frequency-doubled
GaAlAs	-	Gallium Aluminum Arsenide
QCW	-	Quasi-continuous-wave
IR	-	Infrared

ABSTRACT

The diffraction and interference of light are easily observed phenomena that give direct, tangible evidence of the wave nature of light. Diffraction is the root of many technology, scientific techniques and common visual phenomena. In this study, an experimental setup for CD and DVD optical data storage, and human hair measurement were describes based on the diffraction effect. Investigations were performed using monochromatic laser light which will be diffracted on CD and DVD, and human hair. The diffraction patterns were observed on a target screen. From this diffraction pattern the thickness of human hair and track spacing on CD and DVD were measured. The thickness of human hair was obtained in the range between of 66.5 μm to 112.0 μm . While, track spacing on CD was obtained in the ranges between 9.42 nm to 10.23 nm and for DVD was between 3.03 nm to 3.91 nm.

ABSTRAK

Pembelauan dan interferen cahaya adalah fenomena yang mudah diperhatikan yang mana dapat memberi bukti secara langsung, terang dan nyata tentang sifat-sifat gelombang cahaya. Pembelauan ialah asas bagi kebanyakan teknologi, teknik-teknik saintifik dan fenomena penglihatan yang biasa. Dalam kajian ini, satu eksperimen disediakan untuk mengukur penyimpanan data optikal bagi CD dan DVD, serta pengukuran terhadap rambut manusia dan eksperimen ini dihuraikan berdasarkan kesan pembelauan. Kajian ditunjukkan menggunakan cahaya laser monocromatik yang akan dibelau pada CD dan DVD, serta rambut manusia. Corak pembelauan yang diperolehi diperhatikan pada tabir sasaran. Daripada corak pembelauan yang diperolehi, ketebalan rambut manusia dan penyimpanan data optikal pada CD dan DVD dapat diukur. Ketebalan rambut manusia yang diperolehi adalah dalam julat $66.5 \mu\text{m}$ sehingga $112.0 \mu\text{m}$. Manakala penyimpanan data optikal pada CD adalah dalam julat 9.42 nm sehingga 10.23 nm dan bagi DVD adalah dalam julat 3.03 nm sehingga 3.91 nm .