Sudan University of Science & Technology
College of Postgraduate Studies

Thickness and Refractive Index Measuring Arrangement as a first Stage for an Optical Coherence Tomography System

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requirements for the degree of

M. Sc. in physics

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Dedication

T**o**

M*y* ***Parent's*** *Soul ….*

M*y* ***S****isters….*

M*y* ***B****rothers….*

M*y* ***F****riends …*

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الخلاصة

في هذا العمل تم بناء منظومة تداخل مايكلسون مع وحده مسح باستخدام الهيليوم نيون ليزر كمرحله أولي لبناء منظومة Optical Coherence Tomography (OCT) بهدف تحديد سمك ألواح زجاجية شفافة وقياس معامل الانكسار لها.

تتكون المنظومة من جزئين, الجزء الاول مدخال مايكلسون, اما الجزء الثاني في المنظومه فهو عباره عن وحده مسح للأهداب المتكونه من تداخل الضوء في مدخال مايكلسون, وهذه الوحده تتكون من كاميرا رقمية وكاشف مع راسم ذبذبات .

ومن خلال حساب سمك بعض الالواح الزجاحيه التي تُتغير من حالة أهداب التداخل عند وضعها في أحد طرفي مدخال مايكلسون, تم حساب التغير الذى طرأ في الاهداب ومعامل انكسار الالواح الزجاجيه ,و من خلال العلاقه المعروفه بين سمك الالوح والتغير الحاصل في الأهداب يمكن الوصول لقياس سمك اي جسم شفاف عند وضعه في مدخال مايكلسون من خلال تطبيق تلك العلاقة.

Abstract

This work deals with the first step of optical image technique called optical coherence tomography (OCT), an interferometric imaging technique that provides cross-sectional views of the subsurface microstructure of a sample. Following a discussion of the basic theory of OCT, an overview of the issues involved in the design of the main components of OCT system is presented.

Also, a Michelson interferometer with scanner unit (digital CCD camera and photodetector with oscilloscope) was used, and the shift in the circular fringes was used to measure the thickness and refractive index of transparent materials through the mathematical relation between the differences of the number of fringes before and after putting the transparent glass plate and thickness.

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