Dedication

To whom my words are not enough to expiree my deep indebtedness, thanks and gratefulness.

To my parents the sustainable source of tenderness, kindness and endless support and specific.

My dedication also extends to my brothers, sisters,

colleagues, friends, relatives and teachers.

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Abstract

In this work an optical fiber current sensor was designed and implemented using helium-neon laser (with wavelength of 632.8 nm and power of 1 mW) as light source, single mode fiber based sensing element and photomultiplier as detector. The optical sensors used for measuring electrical currents are, in fact, magnetic field sensors based on the magneto-optic Faraday Effect in optical fiber, and its importance is coming from the fact that measuring electrical currents in high voltage substations using conventional current transformers (CT) utilize an iron core and windings ratio to step down the current measured in the primary to a more manageable current level for secondary devices such as meters and relays. This signal may be distorted due to saturation of the magnetic core or electromagnetic waves interference, and it is usually an issue that involves a great deal of insulation.

The use of optical technology in this field greatly reduces the need for insulation considering its intrinsic dielectric characteristics and immune from electromagnetic interference.

This sensor is presently designed to cover current in the range of (20 A to 450 A). Preliminary experimental results for an optical fiber current sensor are presented. The sensor gave good results under various

electrical current supply values, and responded in a linear fashion to an applied electric current. The results proved that the optical fiber current sensors can be used in high voltage substations due to their superior accuracy, bandwidth, dynamic range and inherent isolation.

الخلاصة

في هذا البحث تم تصميم وبناء متحسس ضوئي لـ قياس التيار الكهربائي العالي في مدى الكيلو أمبير (20 أمبير ـــ 1000 أمبير) .

المتحسس الضوئي تتكون من ليزرالهليوم - نيون ذي الطول الموجي 632.8 نانومتر وبـ قدرة 1 ملي واط كمصدر ضوئي و ليف بصري أحادي النمط يعمل كعنصر تحسس وكاشف ضوئي لتسجيل التغيرات في شدة شعاع الليزر .

هذا المتحسس البصري يعمل علي مبدأ تأثير فراداي المغنطيسي الضوئي(Magneto-optic Faraday Effect) . ان اهمية مثل هذا المتحسس تأتي بسبب **ان قياس التيار الكهربائي في محطات الجهد العالي الفرعية في انظمة القدرة الكهربائية بإستخدام محولات التيار ذات القلب المغناطيسي تظهر** بعض المشاكل خاصة **التشوه في خرجها في حالة الاعطال حيث تكون التيارات عالية جداً. هذه التشوهات تكون نتيجة للتشبع في القلب المغناطيسي اوتكون نتيجة للتداخلات** الكهرومغناطيسية . وكذلك هذه المحولات تتطلب عزل ضد الجهود العالية وهذا مكلف, في حين ان الطرق الضوئية يمكنها حل هذه المشكلات .

تم إختبار المتحسس لـ قياس التيار بتطبيق تيار كهربائي في المدى مابين (20 أمبير ـــ 450أمبير) .

أظهر المتحسس نتائج جيِّدة في المدى المذكور و د قة عالية بالاضافة الى استجابة خطية للتيار الكهربائي المطبق. اثبتت النتائج انه يمكن إستخدام المتحسس الضوئي لـ قياس التيار في محطات الجهد العالي الفرعية او لـ قياس التيار في محطات التوليد نتيجة للد قة العالية والمدي العريض للـ قياس , وكذلك لعدم حوجته للعزل ضد الجهود

العالية ,و لمناعته ضد التداخلات الكهرومغناطيسية والتداخلات الراديوية , ولصغر حجمه و سهولة تركيبه.

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