بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

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AIN SHAMS UNIVERSITY

FACULTY OF ENGINEERING

Electronics and Electrical Communications Engineering

High Resolution MEMS Spectrometer

A Thesis submitted in partial fulfillment of the requirements of the degree of

Master of Science in Electrical Engineering

(Electronics and Electrical Communications Engineering)

by

Amir Khaled Shaheen

Bachelor of Science in Electrical Engineering

(Electronics and Electrical Communications Engineering)

Faculty of Engineering, Alexandria University, 2013

Supervised By

Prof. Dr. Diaa Abdel Maguid Khalil

Dr. Yasser Mohamed Sabry

Cairo - (2021)

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Examiners' Committee

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Date:

Statement

This thesis is submitted as a partial fulfillment of Master of Science in Electrical Engineering, Faculty of Engineering, Ain shams University.

The author carried out the work included in this thesis, and no part of it has been submitted for a degree or a qualification at any other scientific entity.

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Thesis Summary

This thesis aims at presenting a high resolution Micro-Electro-Mechanical Systems (MEMS) spectrometer based on a Fourier Transform Infra-Red (FTIR) spectrometer cascaded by a Fabry Perot Interferometer (FPI). By doing so, this spectrometer architecture would benefit from the high resolution provided by the FPI and the wide band operation provided by the FTIR spectrometer. This system is analysed, and a DSP algorithm is developed to get the high resolution spectrum. The cascaded spectrometer is validated in the lab using a multi-mode based Extrinsic Fiber Fabry Perot Interferometer (EFFPI) cascaded by a MEMS based FTIR spectrometer. A model is also developed to study the performance of the multi-mode EFFPI. The experimental measurements showed an improvement of 4x in the spectral resolution when compared to the resolution of the FTIR spectrometer alone.

Key Words:
MEMS FTIR Spectrometers, Fabry Perot Interferomters, Extrinsic Fiber Fabry Perot Interferomter, High Resolution, Multi Mode fibers.

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