

Photoelastic Modulator Main Spindle



AI Overview

The main spindle of a photoelastic modulator is essentially the central resonant element that vibrates to induce periodic birefringence in the optical material, enabling precise polarization modulation. Function of the Main Spindle In a photoelastic modulator (PEM), the main spindle corresponds to the resonant bar or optical element that is mechanically stressed to modulate light polarization. This spindle is typically made of isotropic optical materials such as fused silica, quartz, or calcium fluoride, which are transparent and capable of sustaining high-frequency vibrations. The spindle's vibration along its longest dimension produces a periodic strain, which changes the material's birefringence due to the photoelastic effect. This modulation allows the PEM to alter the phase retardation of transmitted light dynamically.

Mechanical and Optical Design The main spindle is coupled to a piezoelectric transducer, which drives the spindle at its natural resonant frequency. The resonance is critical because it amplifies the mechanical oscillation, enabling highly sensitive and rapid polarization modulation. The spindle's length, material properties, and the speed of sound in the material determine the resonant frequency, which is typically in the tens of kilohertz range (e.g., 50–84 kHz) for visible and near-infrared applications. The spindle may be designed for one-dimensional or two-dimensional vibration, depending on the modulation requirements.

Operational Advantages The main spindle's precise oscillation ensures that the PEM can achieve fast, high-precision measurements in applications such as ellipsometry, polarimetry, and stress analysis. Its isotropic nature when unstressed allows for a wide acceptance angle and large aperture, making the device versatile across different wavelengths and optical setups. The spindle's durability and resonance stability are key to the long-term performance of PEMs, with some devices remaining operational for decades.

Summary The main spindle in a photoelastic modulator is the core vibr...

Article Content

A simple, inexpensive photoelastic modulator

A block of birefringent gelatin acts as a variable retarder when driven harmonically by a speaker coil and can be used to vary the polarization of a laser beam sinusoidally. We model this

Photoelastic Modulator

Our Photoelastic Modulators deliver precise, high-frequency polarization modulation. Available in 1D and 2D designs for applications.

Photoelastic Modulators: Dynamic Polarization Control

Typical applications of photoelastic modulators Polarization Measurement: PEMs are critical components in polarimeters and ellipsometers, allowing for accurate

Imaging with photoelastic modulators

Photoelastic modulators (PEMs) are among the most robust and precise polarization modulation devices, but the high frequency free-running nature of PEMs challenges their

Photoelastic Modulators (PEMs)

What is a Photoelastic Modulator (PEM) and how does it work? A Photoelastic Modulator (PEM) is an optical device that modulates the polarisation of light to

PEM Technical Overview rev2 web

The PEM may be used in two basic modes: as a modulator, to produce polarization modulation of a light beam, or as an analyzer, to determine the polarization states of a light beam.

HINDS INSTRUMENTS PEM-CSC USER MANUAL Pdf Download

Hinds photoelastic modulators are used for measurement of circular and linear dichroism, birefringence, optical rotation, ellipsometry, polarimetry, reflection difference spectroscopy and FTIR double

Photoelastic Modulator

This is why even an isotropic material like glass shows a first-order photoelastic effect, but cannot show a first-order electro-optical effect. If the input light to the elastic modulator is linear-polarized ®

Photoelastic Modulators

Photoelastic modulator is applied for changing the polarization state of light, and make the transmitted light have a dynamic phase retardation. The light-passing part of the device is made of isotropic

Overview of Phase Modulation Technology

Both polarizers are held fixed during the measurement while the photoelastic modulator is used to induce a modulated phase shift of the reflected beam. The light is analyzed by a grating

Photoelastic Modulators

Photoelastic modulators from Hinds Instruments are key components of photonics applications, and are a key piece in a wide range of polarization-based

Photoelastic light modulators – advanced products by

Photoelastic light modulators Photoelastic modulators (PEMs) are a key component across a diverse range of photonic applications. Our portfolio of Photoelastic

Magneto-optical spectrometer based on photoelastic modulator with ...

In addition, for such kinds of modulators broad-aperture beams can be used. In the present study we have designed and established a magneto-optical spectrometer based on the light

Basic optical properties of the photoelastic modulator part I: useful ...

The photoelastic modulator (PEM) is a resonant polarization modulator. It operates at the resonant frequency of a desired mechanical vibration mode of its optical element. The PEM is made

PEM Technical Overview rev2 web

The PEM200 photoelastic modulator is an instrument used for modulating or varying (at a fixed frequency) the polarization of a beam of light. The basic PEM system includes the PEM-200

Photoelastic modulator explained

The principle of operation of photoelastic modulators is based on the photoelastic effect, in which a mechanically stressed sample exhibits birefringence proportional to the resulting strain.

High speed stress measurement technique based on photoelastic modulator ...

In this work, a high-resolution method for residual stress measurement in silicon wafer based on photoelastic modulator was introduced. Then, to improve

Physics: Photoelastic modulator

The principle of operation of photoelastic modulators is based on the photoelastic effect, in which a mechanically stressed sample exhibits birefringence proportional to the resulting strain.

Principles of PEM Operation

View an Animated Tutorial of PEM Principles of Operation. The phenomenon of photoelasticity is the basis of operation for the PEM.

MULTIPHYSICS MODELING OF A NOVEL PHOTOELASTIC MODULATOR

ABSTRACT We present the multiphysics model and simulation of a virtual stack/phased array (VSPA) photoelastic modulator (PEM), a novel type of high-retardation PEM (Buican 2008) for use in ultra

[2106.10580] Longitudinal piezoelectric resonant photoelastic modulator ...

Here, we report a new type of single frequency intensity modulator that we refer to as a longitudinal piezoelectric resonant photoelastic modulator. The modulator consists of a thin lithium

The PEMCSC photoelastic modulator is an instrument used for

The PEMCSC photoelastic modulator is an instrument used for modulating or varying (at a fixed frequency) the polarization of a beam of light.

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