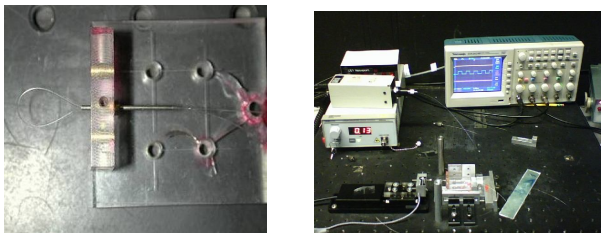


## Abstract

Fiber-optic loop sensors are investigated in this work for a response to load and associated deflection as measured in an optical signal power modulation. The loop sensors are applied in a laminated glass fiber consisting of four or eight layers and tested for repeatability of power output with respect to deflection. The tests use various mounting methods on glass-fiber composite laminated materials or in free space. Of the orientations tested, the most repeatable results are obtained for a loop in free space perpendicular to the plane of the composite and with a load in line with the loop axis. Limited success follows for a compressed loop secured along the plane of the composite with the load perpendicular to the axis of the loop.

## Problem definition



- Use a fiber optic loop as a sensor
  - Measure intensity losses and calibrate with load and deflection of a composite material
- Evaluate fiber optic loop sensor configurations
  - Repeatability
  - Sensitivity

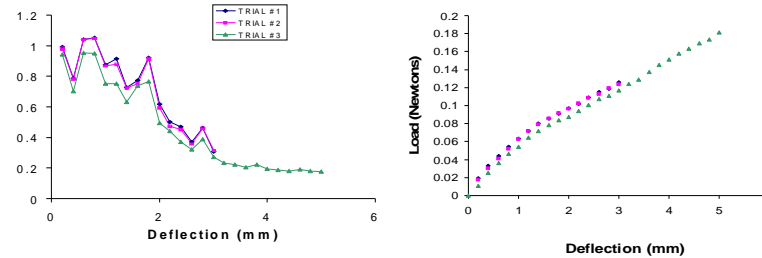
## Tested Configurations

Eight fiber loop sensor configurations

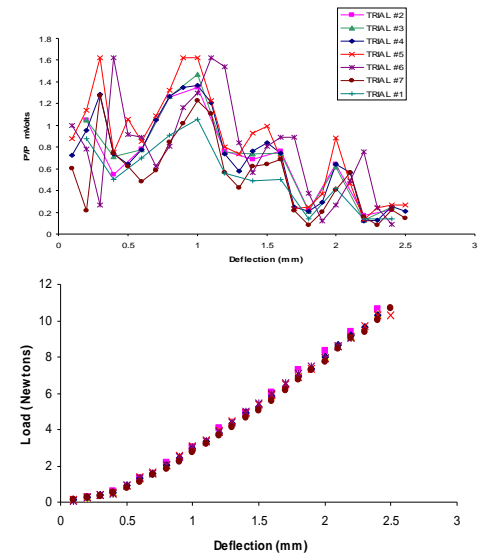
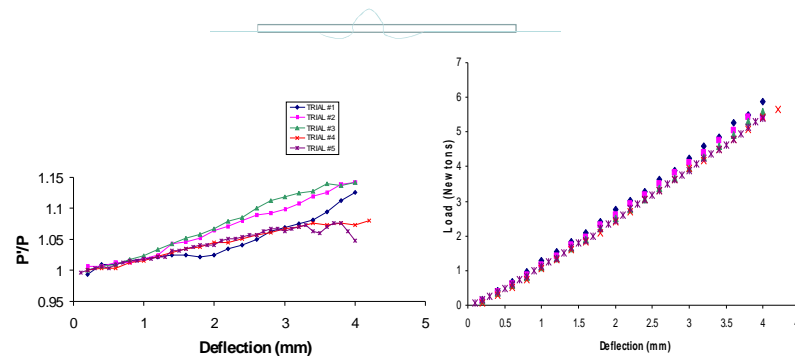
- Loop in free space
- Attached fiber to sample
  - loop
  - ellipse
- Through a hole
- Weaved into sample
- Loop behind sample
  - test jig

# Evaluation of Fiber-Optic Loop-Sensor Mounting on Laminated Glass Fiber Composites Based on Power Modulation

## 5mm Loop Placed in Free Space Loaded Parallel to Major Axis



## Weaved Through Two Holes .5 inches apart Middle Loop Radius = 2.71mm



## Limited Repeatability

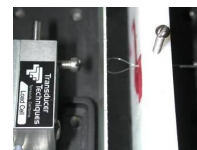
- Variation in laser intensity,
- Variation in optical detector
- Optical connectors,
- Data spikes ( filter)
- Samples deform, Temp effects,

Wear in

## Further Research

- Optical signal splitter
- Stabilize the laser signal
- Filter noise
- Uniform material for initial testing

## Loop Mounted Behind Sample in Test Jig



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