**Planar Micromachined Glass Cantilevers utilising Integrated Bragg Fabry-Pérot Cavities**

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**Abstract:** Here we demonstrate a glass cantilever (figure 1) based on a unique micromachining and etching approach, combined with UV written Bragg gratings [1]. We shall also discuss the increase in sensitivity by using two Bragg gratings to form Fabry-Pérot cavity. Cantilevers are in ultra sensitive force sensors used in applications such as Atomic Force Microscopy, mass sensing and acoustic transducers.

The deformation of the cantilever was measured by interrogating Bragg gratings along the length of the cantilever. A tuneable laser was used to match the point of highest gradient of reflection of the Bragg grating while a piezoelectric transducer excited the resonant mechanical flexure mode of the cantilever. A Lock-in technique was used to detect the phase shifts associated with the mechanical resonance shifts caused by the deformation of the cantilever. A Fabry-Pérot cavity will have two advantages over the single Bragg grating. Firstly the Fabry-Pérot cavity integrates the total strain seen by the waveguide between the gratings and secondly the Fabry-Pérot cavity increases the sensitivity (dI/dλ) as shown in figure 1. The reflection spectra of a Gaussian apodised Bragg Grating and Fabry-Pérot cavity writen in our planar samples are shown in figure 1. The cavity yields spectral features 17 times steeper than the Bragg grating and this sharpness can further be increased by increasing the finesse of the cavity [2]. We will show recent results in the characterisation of a cantilever utilising a Fabry-Pérot cavity as its interrogation method.

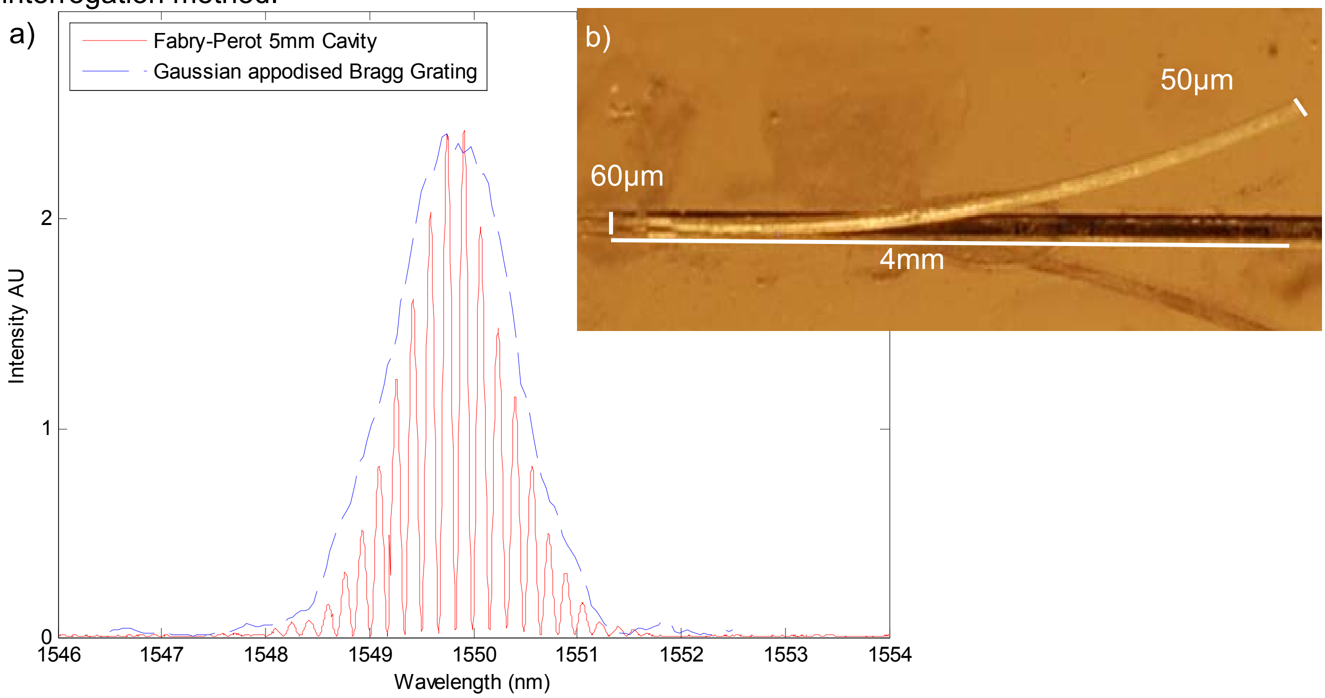


Figure 1 a) shows reflection spectra Fabry-Pérot cavity and Gaussian apodised Bragg grating. Figure 1 b) image shows a close up of the cantilever with approximate measurements.

**References**

[1] C. Holmes, J. C. Gates, D. O. Kundys, C. B. E. Gawith, I. J. G Sparrow, G. D. Emmerson and P. G. R. Smith, "Optical Differential Pressure Transducer using Planar Bragg Gratings in an Etched Membrane", CLEO/Europe-EQEC 2009, Munich 14-19 Jun 2009.

[2] G. Hernandez, Fabry-Perot Interferometers, Cambridge University Press: Cambridge, 1986.