Noninvasive Measurement of the Pressure Distribution in a Deformable Micro-Channel[1] OZGUR OZSUN, VICTOR YAKHOT, KAMIL L. EKINCI, Boston University — Direct and noninvasive measurement of the pressure drop in test sections of a rigid micro-channel is a challenging task. In a micro-channel with compliant walls, however, it is possible to determine the pressure field under flow from the local deflection of the channel walls. Here, we present a robust analytical approach for determining the pressure distribution in a deformable micro-channel under flow. In this method, we first measure the channel deflection profile as a function of applied hydrostatic pressure; this initial measurement provides the constitutive curves for the deformable channel. We then match the deflection profile under flow to the constitutive curves, obtaining the hydrodynamic pressure distribution. We have tested and validated the developed mapping on planar micro-fluidic channels. This method remains accurate in a broad parameter space, and can find possible applications in microfluidics and for characterizing biological flows.

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