Electronic Supplementary Material (ESI) for Lab on a Chip.
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Supplementary Note 1

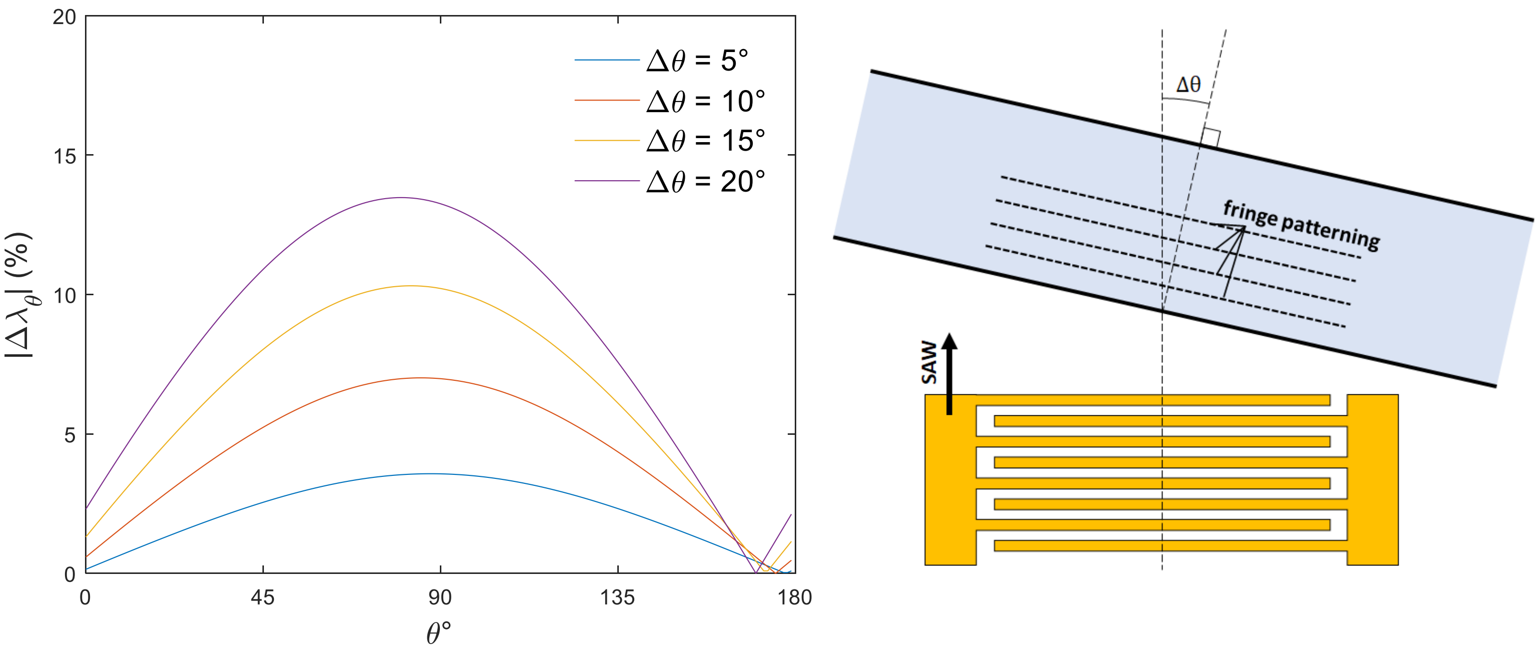

Figure S1: Left – Absolute fringe space deviation with misaligned channels, here plotted for misalignment values of $\Delta\theta = 5°, 10°, 15°$ *and* $20°$. Right – The channel misalignment value, $\Delta\theta$, is given by the divergence between the intended channel angle (with respect to the acoustic propagation direction) and the intended one (here for an intended θ value of 0°).

Figure S1 above shows the absolute change in fringe space values, $|\Delta\lambda_\theta|$, for different values of misalignment, calculated according to

$$|\Delta\lambda_\theta| = \frac{\lambda_\theta - \lambda_{\theta-\Delta\theta}}{\lambda_\theta}$$

The channel misalignment is measured by the difference in θ between the intended channel angle and the fabricated one. Even in the absence of alignment markers on the substrate and on the channel, values in Δθ are highly unlikely to be greater than 10°. For a design channel angle of 0° and misalignments of up to Δθ = 20°, the resulting fringe spacings vary less than 2.3% (very left of Figure S1 above) from the fringe spacing at 0°. For comparison, a conventional half-wavelength channel for particle focusing, perhaps 5 mm long with λ_{SAW} = 300 µm, would have nodal positions 180° out of phase – and thus be entirely non-functional – with a misalignment of only Δθ = 1.7°, though even smaller misalignments would result in particles being directed to non-intended outlets.

The effect of misalignment on fringe spacing deviation here is larger for intermediate angles (around θ = 90°), though even for a channel design angle of θ = 90° a misalignment of Δθ = 20° results in only a shift of ~13% in fringe spacing. In the case examined in our manuscript, where a channel is oriented at θ = 90°, choosing a sufficiently small channel width (i.e. W ≈ $\lambda_{90°}$) means that even such large misalignments still results in only two acoustic force potential minima at the channel edges. Indeed, we show in our final figure that a ‘misalignment’ of all possible angles (0°→180°) still results in only two focusing positions at the channel edges.