Shook *et al.* Reply: L. V. Levitin *et al.* have proposed an alternative interpretation of the results we presented in [1]. They suggest that the observation of two discontinuities in our Helmholtz resonances can be attributed to the A to B transition occurring at two distinct temperatures in different regions (channel and basin) of the devices rather than the presence of an intermediate phase [2]. They present theoretical curves for the A-B boundary based on the assumption that the reduced thickness $D/\xi_{\Delta}(T_{AB})$ is a universal value that may be used to rescale the transition temperature T_{AB}, as described in Ref. [3]. Their calculation only approximates strong-coupling corrections, and we follow up with our own calculation using the full Ginzburg–Landau theory with strong coupling [4], using values taken from Ref. [5], in Fig. 1. Our full calculation suggests that two regions of differing thickness do not account for the data.

Nonetheless, L. V. Levitin *et al.*'s suggestion is an important one. Our simplified analytical model, presented in Ref. [1], ignores any contribution from the basin to the superfluid resonator frequency since very little fluid motion occurs in the basin. Ordinarily, to take into account higher-order corrections to a mechanical mode, we would turn to finite-element modeling. Unfortunately, in this case, finite-element simulations do not properly model the unusual properties of the superfluid. Instead, this issue will have to be experimentally tested. For one, we would suggest that L. V. Levitin *et al.* use their powerful NMR technique and their new architecture [6], which minimizes the bowing to which their previous devices were prone [7], to explore the high-pressure and tight-confinement regions that in our data show the largest regions of stabilized pair density wave state. In addition, we have designed a new generation of superfluid Helmholtz resonators that have a single confinement depth across the entire device. We anticipate that these two independent experiments, along with the suggestion we made in Ref. [1] to measure high-frequency collective modes, should be able to resolve the nature of the phase transitions we have observed.

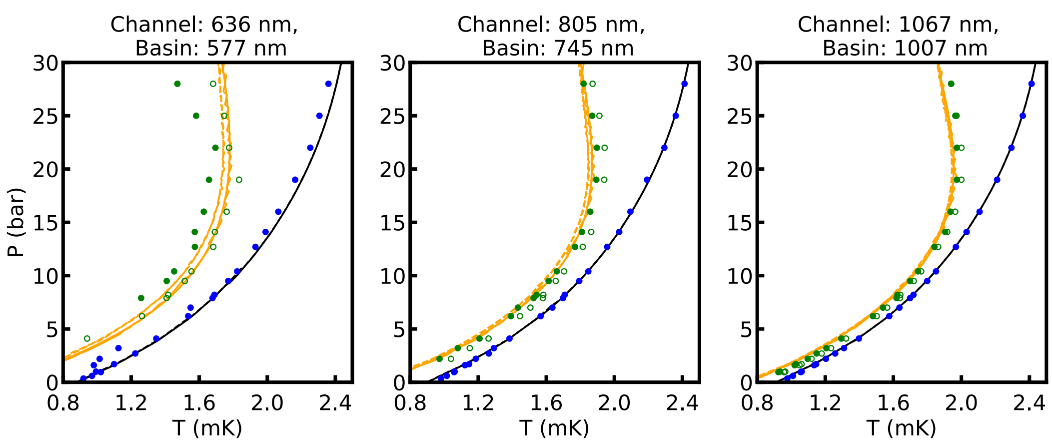

FIG. 1. Phase diagrams of the three devices presented with the same experimental data as in Ref. [1]. Orange solid and dashed curves represent the A-B boundary for the channel and basin, respectively, as predicted by our strong-coupling corrected Ginzburg–Landau calculation. The black curve is the calculated superfluid critical temperature, which is essentially indistinguishable for the two thicknesses.

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