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Helium-3 Confined to a 1.08 Micron Deep Cavity[1] NIKOLAY ZHELEV, ABHILASH SEBASTIAN, Cornell University, LEV LEVITIN, BEN YAGER, ANDREW CASEY, JOHN SAUNDERS, Royal Holloway University London, JEEVAK PARPIA, Cornell University — We describe measurements of superfluid Helium-3 confined to a high-aspect ratio cavity within the head of a high quality factor torsion pendulum. The 1.08 μm deep, rotationally symmetric cavity (11 mm diameter) is defined into a 14 mm diameter silicon disk. The silicon disk is anodically bonded to a matching octagonal glass piece to complete the torsion head. The thickness of 1 mm for both the glass and the silicon ensures minimal distortion of the cavity up to a few bars of pressure. We observe that the normal fluid component stays coupled to the smooth walls of the cavity down to the lowest measured temperatures. By tracking the torsion pendulum frequency and quality factor, we can identify a well defined superfluid transition in the fluid within the pendulum head. We plan to map out the phase diagram for the highly confined Helium-3 at low pressures and observe whether a "stripe phase" is realized in the vicinity of the transition between the A and B superfluid phases.[2]

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[2]A.B. Vorontsov and J.A. Sauls, PRL 98, 045301.

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