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The Design and Testing of a Device to Limit Superfluid Helium Film Flow[1] DAVID G. HAASE, DILLON K. FRAME, JAMES R. ROWLAND, Physics Department, North Carolina State University, Raleigh, NC 27695-8202 — A proposed new measurement of the electric dipole moment of the neutron (the nEDM project) uses a volume of superfluid liquid ^{4}He to trap neutrons from the Spallation Neutron Source as ultracold neutrons. Polarized ^{3}He atoms dissolved in the liquid serve as a co-magnetometer. The measurement process will require the distillation of 10^{-10} concentrations of depolarized ^{3}He from liquid ^{4}He. Unfortunately, a superfluid ^{4}He film flows up the walls of its container where it eventually evaporates and would overwhelm the ^{3}He vapor removal. Following a design employed by NASA on the cryogenic helium-cooled XRS satellite [1] we have had manufactured at NCSU 300 micron thick, 0.75 inch square silicon wafers which include gas flow orifices and rows of etched ridges. The reduced radius of curvature of the superfluid film at the atomically sharp ridges reduces the film thickness to stop film flow. We have designed and constructed a closed-cycle cryocooler-based cryostat to test and to characterize these silicon "film pinners." We will discuss the design and operation of the cryostat and initial tests of the etched pinners.

[1] P. J. Shirron and M. J. DiPirro, Adv. in Cryo. Engineering, vol. 43, p. 949, 1998.

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