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Development of a Planar Josephson Junction for Helium-4 JEFFREY BOTIMER, EUNJONG KIM, California Institute of Technology, BENJAMIN KING, University of Nevada, Reno, KEITH SCHWAB, California Institute of Technology — We are investigating the transport of superfluid helium-4 through a two dimensional, nano-porous polymer material in the temperature interval 300mK to T_λ. The crystalline material is covalently bonded, a single molecule thick, and supported on a 50nm silicon nitride frame, covering a two-micron aperture. We expect this junction structure to realize a weak-link for temperatures far below the superfluid transition temperature, leading to much larger critical current densities than previously demonstrated junctions which operate very close to T_λ where the superfluid density and resulting mass current is greatly reduced. We expect this junction to lead to ultra-sensitive superfluid interferometers with the sensitivity beyond that of atomic matter wave interferometers and the sensitivity to resolve the fluctuations in the Earth rotation in a hand-sized device.

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