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Signatures of phase fluctuations in the superfluid density through the field-tuned superconductor-insulator transition[1] SHASHANK MISRA, LUKAS URBAN, Princeton University, MINSOO KIM, GANAPATHY SAMBANDAMURTHY, University at Buffalo-SUNY, ALI YAZDANI, Princeton University — The superconductor-insulator transition in amorphous two-dimensional metal films remains mysterious because the nature and role of superconducting fluctuations have not been conclusively identified, despite the central role they play in various exotic electronic states that have been proposed for these systems. This is partly because most of our current understanding of amorphous two-dimensional superconductors originates from conventional electrical transport data, which is focused on measuring dissipation. Instead, we use a two-coil mutual inductance technique to measure the superfluid density of both amporphous $MoGe$ and $InOx$ thin films through the field-tuned superconductor-insulator transition. We find that superconducting phase fluctuations leave a signature in the superfluid density, which we track up to the point that the magnetic field completely suppresses the superfluid response.

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