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Service de Physique de l'Etat Condensé  
SÉMINAIRE

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Mercredi 10 juin 11h15

Orme des Merisiers SPEC Salle Itzykson, Bât.774

Scanning Tunneling Spectroscopy of thin films close to the  
Superconductor-Insulator Transition

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Homogeneously disordered superconducting TiN thin films close to the superconductor-insulator transition (SIT) have been investigated by scanning tunneling spectroscopy [1]. At low temperature, we observed spatial fluctuations of the superconducting gap  $\Delta$  in agreement with theoretical predictions [2,3]. When the sample gets closer to the critical disorder, its superconducting critical temperature  $T_c$  is significantly depressed towards zero while these inhomogeneities are reinforced with a local strong  $\Delta/T_c$  ratio. This non vanishing spectral gap demonstrates the persistence of local superconducting pairing across the disorder-tuned SIT. At higher temperature, a pseudogap state has been revealed above  $T_c$ . The thermal evolution of the density of states at the Fermi level in this pseudogap regime, analysed in the framework of disorder-enhanced two-dimensional superconducting fluctuations, gives a clear signature of short-lived Cooper pairs well above  $T_c$ . The interplay of these superconducting fluctuations with the Coulomb interaction will be discussed.

[1] B. Sacépé, *et al.* Physical Review Letters **101**, 157006 (2008).

[2] A. Ghosal, M. Randeria, and N. Trivedi, Phys. Rev. Lett. **81**, 3940 (1998); Phys. Rev. B **65**, 014501 (2001).

[3] M. A. Skvortsov, and M. V. Feigel'man, Phys. Rev. Lett. **95**, 057002 (2005).

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