

# ICAP2022

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## Observation of Cooper Pairs in a Mesoscopic 2D Fermi Gas

*Wednesday, 20 July 2022 17:00 (1h 30m)*

Pairing is the fundamental requirement for fermionic superfluidity and superconductivity. To understand the mechanism behind pair formation is an ongoing challenge in the study of many strongly correlated fermionic systems.

On this poster, I present the direct observation of Cooper pairs in our experiment. We have implemented a fluorescence imaging technique that allows us to extract the full in-situ momentum distribution with single particle and spin resolution. We apply it to a mesoscopic Fermi gas, prepared deterministically in the ground state of a two-dimensional harmonic oscillator. Our ultracold gas allows us to tune freely between a completely non-interacting unpaired system and weak attractions where we find Cooper pair correlations at the Fermi surface. When increasing the interactions even further, the pair character is modified and the pairs gradually turn into tightly bound dimers. The collective behavior that we discover in our mesoscopic system is closely related to observations in nuclear physics or metallic grains. Our method provides a new pathway to study many of the outstanding questions concerning fermionic pairing, for example in imbalanced systems or the normal phase.

### Presenter name

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### online poster URL

[https://drive.google.com/file/d/1FQRI8EKqYa-Rbg8iMmZ\\_\\_rCKqTLXyIrS/view?usp=sharing](https://drive.google.com/file/d/1FQRI8EKqYa-Rbg8iMmZ__rCKqTLXyIrS/view?usp=sharing)

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