

School of Physics and Astronomy

COLLOQUIUM



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The materials science of Josephson junctions: modelling their formation, imperfections and electrical response atom by atom

The basis for superconducting electronics is the Josephson junction, a thin insulating barrier that separates two superconducting leads and thereby behaves as a tunneling barrier. These junctions are the non-linear circuit element inside superconducting quantum interference devices, low temperature microwave electronics, and superconducting quantum computers.

The width of this barrier can be as thin as two nanometers and the electronic properties of such junctions are therefore strongly dependent on the morphology of the barrier, both at the interfaces of the superconducting leads and within the metal oxide itself. Using a range of computational techniques we analyse the role of defects within the junctions, how the junctions are formed and how their electrical response depends on the junction microstructure. These simulated results are then compared to experimental measurements of junctions within various circuits. Our results provide new insights into the influence of fabrication conditions on the electrical response of metal-oxide barriers and the resulting performance of quantum technologies constructed from them.

Date: Wednesday 13 November

Time: 2pm

Venue: L1, Seminar Room 107, 10 College Walk, Clayton

Info: Jesper Levinsen

