

Senior Research Associate in Superconducting Quantum Amplifiers
JOB DESCRIPTION
Job vacancy: 0628-22

Job Title: Senior Research Associate	Present Grade: 7
Department/College: Physics	
Directly responsible to: Dr Edward Laird, Prof Yuri Pashkin, and Dr Ian Bailey	
Supervisory responsibility for: Partial responsibility for graduate and MPhys students	
Other contacts Internal: members of the Physics Department External: STFC QSHS project partners, professional bodies, academic and research networks	
<p>ParaPara is a new project to develop a parametric amplifier based on quantum paraelectricity. This postholder will take the lead in designing, fabricating, and testing prototype amplifiers. This kind of amplifier will have many uses, but during this project the focus will be on applying it within the QSHS axion search experiment.</p> <p>The amplifier will consist of a superconducting resonator or waveguide fabricated on a paraelectric chip. Since paraelectric materials are non-linear dielectrics, this device can operate as a parametric amplifier, possibly with quantum-limited sensitivity. The objectives of the ParaPara project are</p> <ol style="list-style-type: none"> 1) To demonstrate and characterise a quantum paraelectric amplifier based on a superconducting resonator, and to show that it can operate in a magnetic field. 2) To demonstrate and characterise a travelling-wave amplifier based on the same principle. 3) To operate this amplifier inside the QSHS haloscope test facility currently under construction at Sheffield. <p>The project will be undertaken chiefly in the Physics Department of Lancaster University and is experimental in nature. An essential part of the project will be device fabrication using state-of-the-art nanofabrication facilities available in the Lancaster Quantum Technology Centre cleanroom. Device characterisation will be performed in cryogen-free dilution refrigerators equipped with microwave measurement lines and cold amplifiers. The postholder will work in the Physics Department, but travel to project partners is to be expected.</p> <p>Major Duties:</p> <ul style="list-style-type: none"> • Develop a parametric amplifier based on paraelectricity, by designing and fabricating prototype amplifiers and characterising their noise and gain performance; • Apply this amplifier to the search for axions, by installing it inside the QSHS haloscope test facility currently under construction in Sheffield; • Publish papers in peer-reviewed journals, and contribute to technical reports and grant proposals as required for the project; • Disseminate project results including presenting to project partners and at conferences; • Support PhD students and other members of the Quantum Nanotechnology and Ultra-Low Temperature groups in experimental work related to this project. 	