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Dear Colleague,

It is a pleasure for me to write this recommendation for Alex Kozhevnikov. I know Alex primarily from his graduate career here at Yale in applied physics, and have not kept up to date on his more recent career. So this recommendation is slightly limited and/or dated, but I hope nonetheless useful!

Let me start by saying that I think Alex is extremely talented, and perhaps intellectually the strongest experimental student I have encountered so far, either at Yale or Caltech. It can be very gratifying to work with a student who, even on the first discussion of a new topic, can sometimes finish your sentences for you!

Alex worked very closely with me during the period ('95-'98) when I was a post-doc in Dan Prober's group. Alex assisted in several demanding experiments combining mesoscopic devices, high-frequency transport measurements, and low temperatures. He learned both the physics of mesoscopic electron transport and the practical issues for RF measurements very rapidly. Alex was a valuable contributor to both the measurements of shot noise in diffusive metals (he is coauthor on two Physical Review Letters on this topic), and on the first RF-SET experiments, where he was coauthor on the Science article describing this work.

Since the summer of 1998, Alex has worked entirely independently to extend the non-equilibrium noise experiments to hybrid normal/superconducting (NS) mesoscopic structures. He has read the NS/Andreev mesoscopic literature (not an easy topic) extensively and deeply, and initiated discussions of the theory with experts at other institutions. He has become the local expert on this, as well as guiding the path of this research largely on his own. Alex correctly understood that the best experiment to prove the "doubling" of the effective charge due to Andreev reflection would involve photon-assisted transport in devices with a single NS interface.

In order to carry out these experiments, Alex had to develop a fabrication process for these NS nanostructures. Although we had working electron microscope with a home-made pattern generator, his first task was to install the newly purchased Nability conversion system, which he accomplished in short order, and was quickly writing small features using double-angle evaporation techniques. He had to then develop a multilayer

electron-beam lithography process, however, in order to produce short Au wires with a single Nb contact. This required solving several problems including the cleaning of the first layers to obtain good metallurgical contact, finding resist profiles which allowed lift-off of sputtered Nb, and so on, which he achieved within a few months. With these devices, Alex carried out a successful sequence of measurements at millikelvin temperatures on the shot noise in the presence of a strong high-frequency drive. These results were the first definitive proof that the effective charge of the carriers in a normal metal in contact with a superconducting reservoir is doubled ($q=2e$) because of the process of Andreev reflection. These results have since appeared in Physical Review Letters and resulted in several invited talks.

Alex's communication skills and writing in English are excellent. He gives very good seminars and can place his work in the proper context, and he has given several presentations at international meetings. Despite his "take no prisoners" style of presentation, which can improve with a little more experience, these have been very well received.

Though obviously Alex's graduate career has been quite successful, I suspect that he has actually not lived up to his complete potential yet. Alex can attack a problem mercilessly and fruitfully when it engages his full interest, but he can also be distracted when new ideas arise, or when all that remains is to sweat out the details. He does not always spend time on "trivial" issues like equipment maintenance and keeping the lab clean, though I hope that this will improve with some further seasoning. Of course he has demonstrated the capability to carry a project to completion, but he will still work best with a fair amount of supervision. In comparison to other recent graduates from our department, I would rate him clearly ahead of Ken Segall (postdoc at MIT) and Stefan Friedrich (staff member at Livermore), and intellectually comparable to Peter Burke (Millikan postdoc at Caltech), though not possessing Peter's complete package of drive, perspective, and maturity. Alex's abilities and very strong innate intelligence make him capable of producing very important work.

Sincerely,



Rob Schoelkopf