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3D Effect in Determination of Spin Polarization using Andreev Reflection Spectroscopy JESSICA GIFFORD, CHARLES SNIDER, JONNY MARTINEZ, TINGYONG CHEN, Arizona State University — Andreev Reflection Spectroscopy (ARS) has been utilized to measure spin polarization of many magnetic materials including some half metals, as well as the superconducting gap of superconductors which include the recently discovered Fe superconductors and topological superconductors. The values of spin polarization and superconducting gap are extracted from the ARS data often by a modified Blonder-Tinkham-Klapwijk (BTK) model or the more recent Chen-Tesanovic-Chien (CTC) model. Both consider the ferromagnet/superconductor interface as one dimensional (1D). However, in reality, a tip may have a point angle with three dimensional (3D) effects. In this work, we present both theoretical and experimental studies of the 3D effects in the determination of spin polarization using ARS. We have found that for an ideal interface without interfacial scattering, the 3D ARS spectra are the same as 1D spectra. But for non-ideal interfaces the 3D effect can drastically change the conductance spectra depending on the point angle of the tip. Most importantly, the 3D spectra can be well described by the 1D model with a different interfacial scattering factor and a slightly different inelastic scattering factor. The spin polarization and superconducting gap extracted from the 3D ARS is the same as that extracted using the 1D model, demonstrating that 1D ARS model can be utilized to determine spin polarization as long as interfacial scattering is not of any concern. Finally, we apply the both the 1D and the 3D models to a set of ARS data and show that the extracted spin polarization value is the same for both models.

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