

# Thermodynamic and Spectroscopic Properties of Superconductor-normal Metal-ferromagnet Junctions

Han-Yong Choi<sup>a, b</sup>, Na Young Lee<sup>a</sup>, Hyeonjin Doh<sup>c</sup>

<sup>a</sup> *SungKyunKwan University, Suwon, Korea*

<sup>b</sup> *Asia Pacific Center for Theoretical Physics, Pohang, Korea*

<sup>c</sup> *University of Toronto, Toronto, Canada*

We have studied the superconducting transition temperature  $T_C$  and tunneling conductance of various junctions of superconductor (S), normal metal (N), and/or ferromagnet (F) employing the Usadel equation. In addition to the singlet pairing component, the triplet pairing components are included in the Usadel equation which are induced by the spin flip scatterings at the F interface. We show calculations of  $T_C$  and tunneling conductances of S/F bilayers with and without the spin flip scatterings to understand the effects of the triplet components. We then present calculations of F/S/F and S/F/N/F junctions for the cases where the two F's have parallel and antiparallel magnetizations.

keywords : superconductor-ferromagnet junction, Usadel equation, triplet pairing components, transition temperature, tunneling conductance