Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Electronic density of states of Ca3Ru2O7 measured by tunneling spectroscopy KWOK-WAI NG, ANTHONY BAUTISTA, GANG CAO, University of Kentucky — The ruthenates are perhaps one of the most diverse of group of materials known up to date. These compounds exhibit a wide array of behaviors ranging from the exotic p-wave superconductivity in Sr_2RuO_4, to the itinerant ferromagnetism in $SrRuO_3$, and the Mott-insulating behavior in Ca_2RuO_4. One of the most intriguing compounds belonging to this group is $Ca_3Ru_2O_7$ which is known to undergo an antiferromagnetic ordering at 56K and an insulating transition at 48K. We have prepared $Ca_3Ru_2O_7/Al_2O_3/Ag$ planar junctions and used tunneling spectroscopy to study the density of states of $Ca_3Ru_2O_7$ from room temperature to 4.2K. Distinguish gap structure can be observed in all spectra at temperatures below 48K. The tunneling spectra behave very differently and the gap has dissimilar values along the three crystal axes directions. We have also studied the effect of magnetic field on these spectra by applying an external field up to 7T along the a-axis direction. In this presentation we will summarize our results and discuss their implications in relation to the competition between different interactions in the ground state of this material. This research was supported by NSF grants DMR-0800367, DMR-0856234 and EPS-0814194.

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Date submitted: 20 Nov 2009 Electronic form version 1.4