Abstract Submitted
for the MAS20 Meeting of
The American Physical Society

**Determining the Two Energy Gaps of Assymetrical all-$MgB_2$ Thin Film Josephson Junctions**[1] ROBERTO RAMOS, University of the Sciences, JOSEPH LAMBERT, National Radio Astronomy Observatory, MASAHITO SAKODA, MICHIO NAITO, Tokyo University of Agriculture and Technology — We have previously reported high-resolution tunneling spectroscopy measurements of substructure within the two superconducting energy gaps of Magnesium diboride (MgB ). The samples used consisted of 1-gap/2-gap heterojunctions, where the counter-electrode is a conventional single-gap superconductor (Pb or Sn). Here, we report similar measurements of 2-gap/2-gap all-MgB Josephson junctions. The crystal orientations of the two MgB films are mostly c-axis parallel to the tunneling direction, with very small contribution from the larger $\sigma$ gap. Due to differences in growth conditions, we find that the two MgB electrodes have different T 's and gap values. We represent this physical system using a modified tunneling model where each electrode is represented as a weighted sum of two BCS densities of states. We report results of this ongoing analysis that focuses on (1) a transition from SIS to NIS behavior as temperature increases past the lower Tc electrode, and (2) the presence of multiple quasiparticle peaks due to the sums and differences in pairwise combinations of disparate $\pi$ and $\sigma$ gap values within each electrode.

[1]R.C. Ramos acknowledges support from the National Science Foundation DMR 1555775 and the Charles Kaufman Foundation.

Roberto Ramos
University of the Sciences

Date submitted: 02 Nov 2020 Electronic form version 1.4