Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

**Evidence of a Positron bound state on the surface of $Bi_2Te_2Se$**[1] K. SHASTRY, Z.H. LIM, P.V. JOGLEKAR, VARGHESE ANTO CHIRAYATH, University of Texas at Arlington, B.A. BADIH, D. HEIMAN, B. BARBIELLINI, Northeastern University, A.H. WEISS, University of Texas at Arlington — We describe experiments aimed at probing the sticking of positrons to the surfaces of topological insulators performed at University of Texas at Arlington using the Positron Annihilation induced Auger electron Spectrometer. A magnetically guided beam was used to deposit positrons at the surface of $Bi_2Te_2Se$ sample at energy of $\sim 2$ eV. Peaks observed in the energy spectra and intensities of electrons emitted as a result of positron annihilation showed peaks at energies corresponding to Auger peaks in Bi and Te providing clear evidence of Auger emission associated with the annihilation of positrons in a surface bound state. Theoretical estimates of the binding energy of this state are compared with estimates obtained by measuring the incident beam energy threshold for secondary electron emission and the temperature dependence positronium emission. The experiments provide strong evidence for the existence of a positron bound state at the surface of $Bi_2Te_2Se$ and indicate the practicality of using positron annihilation to selectively probe the critically important top most layer of topological insulator system.

[1]Welch grant 1100 NSF DMR 0907679.

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Date submitted: 14 Nov 2014 Electronic form version 1.4