Abstract Submitted
for the TSF13 Meeting of
The American Physical Society

Experimental evidence for the trapping of low energy positrons at the surfaces of a topological insulator K. SHASTRY, P.V. JOGLEKAR, N.G. FAZLEEV, A.H. WEISS, Univ of Texas at Arlington — We present evidence for the presence of a positron surface state on the surface of a topological insulator. Results from a series of experiments performed at university of Texas at Arlington on a Bi_2Te_2Se sample. A magnetically guided beam of positrons was used to deposit positrons at the sample surface. Peaks in the energy spectrum of electrons emitted as a result of positron annihilation were observed at 23 eV, 55 eV, 99 eV and 283 eV which we attribute to the Bi, Se, Te, and C Auger transitions resulting from surface state positrons annihilating with the O_5 $5d_{5/2}$ O_4 $5d_{3/2}$, M_4 $3d_{3/2}$ (M_5 $3d_{5/2}$), M_4 $3d_{3/2}$ (M_5 $3d_{5/2}$) and K 1s core levels respectively. The existence of these peaks points to the fact that a significant fraction of positrons annihilate at or very close to the surface (we note that if positrons were annihilating uniformly throughout the bulk, the Auger signal would not be seen due to the attenuation of electrons leaving from the bulk. This is evidence for the existence of a surface state). Our results are consistent theoretical calculations by Saniz et al that have shown that such a surface state should exist.

K. Shastry
Univ of Texas at Arlington

Date submitted: 06 Sep 2013 Electronic form version 1.4