

Magnetic Penetration Depth in Overdoped Tl-2201 Superconductors

S.L. Stubbs¹, J.H. Brewer¹, D. Peets¹, R. Liang¹, W. Hardy¹, D. Bonn¹,
P. Russo², J. Sonier³

¹*Department of Physics and Astronomy, University of British Columbia, Vancouver, B.C., Canada V6T 1Z1* ²*TRIUMF, 4004 Wesbrook Mall, Vancouver, B.C., V6T 2A3, Canada*

³*Department of Physics, Simon Fraser University, Burnaby, B.C., Canada V5A 1S6*

Studies of the magnetic penetration depth λ_{ab} *via* the μ^+ SR lineshape in the vortex state has revealed a great deal about *underdoped* cuprate superconductors, including the original confirmation of *d*-wave superconductivity. However, *overdoped* cuprates have been neglected, partly due to the difficulty of doping sufficiently to decrease T_c , and partly because the overdoped materials are thought to be “ordinary Fermi liquid” superconductors, about which many presume we already know everything. In the belief that we may *not* know everything about these materials, the UBC group has set out to grow high quality crystals of $\text{Tl}_2\text{Ba}_2\text{CuO}_{6+\delta}$ (Tl-2201), which can be made *very* overdoped, to the point of $T_c \rightarrow 0$.

We have now used μ^+ SR lineshape studies to measure λ_{ab} as a function of T and H for crystal mosaics with T_c 's of 72, 60 and 46 K. As expected, $\lambda_{ab}^{-2}(T=0)$ continues to increase with doping beyond optimal doping, but then decreases again with higher doping. We also find a strong dependence on the applied field H . The low- T behavior of $\lambda_{ab}^{-2}(T)$ is again strongly linear, as expected for a *d*-wave superconductor.

Also, preliminary work done on new crystal mosaics with T_c 's of 75 and 46 K will be revealed.