Measurements of penetration depth anisotropy in MgB$_2$ J. FLETCHER, A. CARRINGTON, H.H. Wills Physics Laboratory, University of Bristol, Tyndall Avenue, BS8 1TL, United Kingdom., S.M. KAZAKOV, J. KARPINSKI, Laboratorium für Festkörperphysik, ETH Zürich, CH-8093 Zürich, Switzerland. —

The presence of multiple gaps in MgB$_2$ leads to a temperature dependent anisotropy of both superconducting length scales, the London penetration depth, $\lambda$, and the Ginzberg-Landau coherence length, $\xi$. Using a sensitive rf technique, the temperature dependence of both $\lambda_a$ and $\lambda_c$ is measured in single crystals of MgB$_2$. The temperature dependent anisotropy of the penetration depth, $\gamma_\lambda(T) = \lambda_c/\lambda_a$, calculated from measurements is in approximate agreement with that expected from calculations based on the measured superconducting gaps and band structure calculations. Torque and specific heat measurements are used to determine the anisotropy in $H_{c2}$ and the predicted convergence in the anisotropy of $\lambda$ and $\xi$ near $T_c$ is examined.

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