Abstract Submitted for the DFD07 Meeting of The American Physical Society

Thermal Diffusivity of Turbulent Convection J.J. NIEMELA, K.R. SREENIVASAN, The Abdus Salam ICTP — Measurement of the damping at the cell mid-height of a sinusoidal temperature perturbation, superimposed on the bottom plate of a convection cell, yields an effective thermal diffusivity of turbulent convection, up to Rayleigh numbers $Ra = 1x10^{13}$ in cylindrical cells of aspect ratios 1 and 4, using low temperature helium gas. The ability to achieve very high Ra using helium gas, combined with the novel use of this measurement technique, allows us to estimate the height of a "Nusselt layer" adjacent to the horizontal boundaries for which the thermal resistivity is non-negligible. The remainder of the fluid layer constitutes a turbulent core region whose thickness is in good agreement with the calculation of the mean thermal gradient in recent numerical simulations.

Joseph Niemela The Abdus Salam ICTP

Date submitted: 30 Jul 2007

Electronic form version 1.4