Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Experiments and simulations of passive scalars released from concentrated sources in turbulent channel flow[1] EMMANUEL GERMAINE, LUCA CORTELEZZI, LAURENT MYDLARSKI, McGill University — Turbulent mixing of a passive scalar (θ) is studied by means of experiments and numerical simulations in turbulent channel flow, with an emphasis on the scalar dissipation rate (ε_θ). The scalar (temperature) is injected at small scales by a heated line source, aligned in the spanwise direction. The present experiments focus on the evolution of ε_θ downstream of the line source, for different wall-normal source locations. In particular, knowledge of the different components of ε_θ (i.e., $\alpha\langle(\partial\theta/\partial x)^2\rangle$, $\alpha\langle(\partial\theta/\partial y)^2\rangle$, and $\alpha\langle(\partial\theta/\partial z)^2\rangle$, where α is the thermal diffusivity) enable the quantification of the small-scale passive scalar statistics, and their (presumed) return to isotropy from an initially anisotropic injection. Measurements of temperature derivatives were performed by means of cold-wire thermometry. A direct numerical simulation was also undertaken to provide complementary data, difficult to obtain experimentally. The velocity field was independently computed using the freely-available channel flow code of Dr. John Gibson (http://www.channelflow.org). The advection-diffusion equation was solved using a third-order scheme with the flux integral method (Leonard *et al.*, Appl. Math. Modelling, 1995).

[1]Support has been graciously provided by the NSERC (Canada).

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Date submitted: 04 Aug 2010 Electronic form version 1.4