Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

DNS of thermal channel flow for $Re_\tau = 5000$[1] FRANCISCO ALCANTARA AVILA, SERGIO HOYAS CALVO, Universitat Politecnica de Valencia — A new DNS of a thermal channel flow has been conducted at $Re_\tau = 5000$. The thermal field has been considered as a passive scalar and the Mixed Boundary Condition is employed. The Prandtl number of air, 0.71, has been used. A large enough computational box of dimensions $2\pi h$ x $2h$ x πh has been set to obtain accurate statistics. The mesh used had a total of 6144 x 1285 x 6144 $\approx$ 5e10 points. The simulation has run on 2048 cores of the supercomputer MareNostrum. The logarithmic region of the mean temperature profile is starting to be properly developed with a von Karman constant of $\kappa_t = 0.444$. Maxima of the temperature intensities increase and move towards the wall with respect to other cases with lower Reynolds numbers. A power function has been obtained to calculate the Nusselt number as a function of Reynolds, for $Pr = 0.71$. Turbulent Prandtl number does not show remarkable differences with the ones obtained for lower Reynolds and it keeps being close to 1 near the wall. Finally, turbulent budgets for heat fluxes, temperature variance and its dissipation rate have been calculated. Scaling of all terms is analysed and discussed.

[1]This work was partially supported by MINECO/FEDER, under Project No. RTI2018-102253-B-100. Francisco Alcantara Avila is partially funded by GVA/FEDER project ACIF2018. The computations of the new simulations were made possible by a generous grant of computing time from the Barcelona Supercomputing Centre, reference IM-2019-2-0016.

Sergio Hoyas Calvo
Universitat Politecnica de Valencia

Date submitted: 29 Jul 2019 Electronic form version 1.4