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Heat Transport Enhancement of Turbulent Thermal Convection by Inserted Channels[1] KE-QING XIA, LU ZHANG, Department of Physics, The Chinese University of Hong Kong — We report an experimental study on the heat transport properties of turbulent Rayleigh Benard Convection (RBC) in a rectangular cell with two types of 3D-printed structures inserted inside. The first one splits the original rectangular cell into 60 identical sub cells whose aspect ratio is 1:1:10 (length, width, height). The second one splits the cell into 30 sub cells, each with a 1:2:10 aspect ratio and a baffle in the center. We find that for large Rayleigh numbers (Ra), the Nusselt numbers (Nu) of both structures increase compared with that of the empty rectangular cell. An enhancement in Nu as much as 20% is found for the second type of insertion at Rayleigh number 2×10^9. Moreover, the Nu-Ra scaling shows a transition with both geometries. The particle image velocimetry (PIV) measurement within a single sub unit indicates that the transition may be related to the laminar to turbulent transition in flow field. Direct numerical simulations (DNS) confirm the experimental results. Our results demonstrate the potential in using insertions to enhance passive heat transfer.

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Ke-Qing Xia
Department of Physics, The Chinese University of Hong Kong

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