Statistics and Scaling Laws of Turbulent Mixing at High Reynolds Numbers MICHAEL GAUDING, MARKUS HEMPEL, CHRISTIAN HASSE, TU Freiberg — We examine the turbulent mixing of passive scalars with imposed mean gradient and varying diffusivities by means of direct numerical simulation. The transport mechanism within the turbulent cascade is altered when differential diffusion is present. In order to analyze this effect, we derive from first principles an equation in correlation space that quantifies differential diffusion. This equation captures the balance between inter-scale transport, diffusive transport, scalar dissipation, as well as a transport that originates from unequal diffusivities between the involved scalars. This equation is not closed but each term can be analyzed by means of direct numerical simulation. To this end, direct numerical simulations have been conducted with Taylor based Reynolds number varying between 88 and 529. The Schmidt number is varied between 1/8 and 1.

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