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论文

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后向台阶湍流边界层分离、再附及发展

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TURBULENT BOUNDARY LAYER SEPARATION, REATTACHMENT AND REDEVELOPMENT OVER A BACKWARD-FACING STEP

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摘要

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摘要 应用激光测速仪对后向台阶湍流边界层分离、再附及发展进行了测量,得到时均流速、流向湍流度、平坦系数和偏斜系数等沿程分布。依据时均流速分布特性,得到分离区边界及再附点位置  $x_r = 5.2 h_s$  ( $h_s$  为台阶高度),再附后湍流边界层恢复速度型相似的位置  $x_T = 13.5 h_s$ 。在详细分析湍流边界层区域时均及紊动特性的基础上,与光滑平板湍流边界层进行了比较。结果表明,除流速分布对数公式中积分常数较大外,无其它差别。此外,湍流边界层区存在尾流律,尾流参数  $n = 0.29$ 。

关键词: 湍流边界层 分离流 后向断阶

Abstract: In this paper, the LDV has been used to measure the turbulent boundary layer separation, reattachment and redevelopment over a backward-facing step. The developments of mean velocity, turbulent intensity, flatness factor and skewness factor are obtained in the streamwise direction. According to the velocity distribution, the separation line, reattachment position and the starting position of redeveloped turbulent boundary layer are determined. On the basis of analysing the mean and turbulent characteristics in turbulent boundary layer region in detail, it is found that, in comparison with the results given in turbulent boundary layer over a smooth flat plate, there is no difference between them except the greater value of integral constant in Log-Law. In addition, there exists wake law in turbulent boundary layer region, and the wake parameter is equal to 0.29.

Keywords: turbulent boundary layer separated flow backward-facing steps

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