Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Influence of wall roughness on turbulent boundary layer LUKAS VESELY, CHRISTIAN HAIGERMOSER, MICHELE LAVECCHIA, MICHELE ONORATO, Politecnico di Torino, AEROTRANET GROUP TEAM — Measurements were taken with time resolved PIV System in streamwise wall normal plane and plane parallel to the wall for different distances over smooth and 3 types of rough surfaces ($\delta/\mathrm{k}_S \quad < 40$) For smooth case $\mathrm{Re}_\theta = 935$ and for rough cases $\mathrm{Re}_\theta = 1418 \div 1922$. Instant flow images for all roughned walls show features similar to this as expected in a smooth wall turbulent boundary layer. The main differences occur in relation to scaling and level of organization. Large irregularly shaped zones of flow, having relatively retarded uniform values of the streamwise momentum, separated by thin regions of large $\partial \mathrm{u}/\partial \mathrm{y}$ are shown. Along the boundaries trains of negative swirling motions are irregularly aligned, representing the signature on the measurement plane of packets of vortical structures: hairpin vortices and skewed quasi-longitudinal vortices. In wall parallel planes dominant structures typical for smooth wall as low and high momentum zones elongated in the streamwise direction remain. Roughness effects show a similar behavior to that seen in the smooth wall case, where a shift towards the wall of the organized structures can be noted. Detailed analysis was performed to enlighten difference between the different flow fields.

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Date submitted: 02 Aug 2007 Electronic form version 1.4