

Abstract Submitted  
for the DFD11 Meeting of  
The American Physical Society

**PIV measurements of a jet impinging on an opened rotor-stator system at low gap spacing** THIEN NGUYEN, JULIEN PELLÉ, SOUAD HARMAND, Univ Lille Nord de France, F-59000 Lille, France — The current work experimentally investigates the flow characteristics of an air jet impinging to an opened rotor-stator configuration at a low nondimensional spacing  $G = 0.02$  and very low aspect ratio  $e/D = 0.25$ . The rotational Reynolds numbers varied from  $0.33 \times 10^5$  to  $5.32 \times 10^5$  while the jet Reynolds numbers ranged from  $17.2 \times 10^3$  to  $43 \times 10^3$ . PIV measurements were performed at three axial planes for the entire disk diameter. The obtained PIV results agreed with those obtained by LDA measurements and numerical simulation reported in Poncet et al. 2005 (Physics of Fluids 17, 075110). A recirculation flow region, which centered at the impinging point and possessed high turbulent intensities, was observed. The mean flow and turbulent intensities were evaluated with the local heat transfer coefficients measured by Pellé and Harmand 2009 (Applied Thermal Engineering 29: 1532-1543). It is shown that the local peaks and the gradually rising of the radial heat transfer coefficients  $Nu$  are due to the secondary peaks and the increases near the outer radius of the turbulent intensity distributions respectively. POD analysis was applied to the cases of the impinging jet with and without rotation. It is shown that the first POD mode captured nearly 60% total kinetic energy and the low-order POD modes revealed a spiral structure in the jet-dominated region.

Thien Nguyen  
Univ Lille Nord de France, F-59000 Lille, France

Date submitted: 11 Jul 2011

Electronic form version 1.4