## Abstract Submitted for the DFD16 Meeting of The American Physical Society

Helical vortices generated by flapping wings of bumblebees<sup>1</sup> MARIE FARGE, LMD-CNRS, Ecole Normale Supérieure, Paris, France, THOMAS ENGELS, ISTA, Technische Universität Berlin, Berlin, Germany, DMITRY KOLOMENSKIY, Biomechanical Engineering Laboratory, Chiba University, Chiba, Japan, KAI SCHNEIDER, 12M-CNRS, Centre de Mathématiques et d'Informatique, Aix-Marseille Université, Marseille, France, FRITZ LEHMANN, Department of Animal Physiology, UniversiRostock, Rostock, Germany, JORN SESTERHENN, ISTA, Technische Universität Berlin, Berlin, Germany — We analyze high resolution numerical simulation data of a bumblebee with fixed body and prescribed wing motion, flying in a numerical wind tunnel, presented in Engels et al., Phys. Rev. Lett., 116, 028103, 2016. The inflow condition of the tunnel varies from unperturbed laminar to strongly turbulent. The flow generated by the flapping wings indicates the important role of the leading edge vortex (LEV), responsible for elevated lift production and which is not significantly altered by the inflow turbulence. The LEV has a conical structure due to the three-dimensional motion of the wings. This flow configuration produces strong vorticity on the sharp leading edge and the outwards velocity (from the root to the tip of the wing) in the spanwise direction. Flow visualizations show that the generated vortical structures are characterized by a strong helicity. We study the evolution of the mean helicity for each wing and analyze the impact of turbulent inflow.

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