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A slowly rotating impeller in a rapidly rotating fluid. NATHANAEL MACHICOANE, FREDERIC MOISY, PIERRE-PHILIPPE CORTET, Universite Paris-Saclay, INSTABILITY, WAVES AND TURBULENCE TEAM — We characterize the two-dimensionalization process in the turbulent flow produced by an impeller rotating at a rate ω in a fluid rotating at a rate Ω around the same axis for Rossby number $\mathrm{Ro} = \omega \,/\, \Omega$ down to 0.01. The flow can be described as the superposition of a large-scale vertically invariant global rotation and small-scale shear layers detached from the impeller blades. As Ro decreases, the large-scale flow is subjected to azimuthal modulations. In this regime, the shear layers can be described in terms of wakes of inertial waves traveling with the blades, originating from the velocity difference between the non-axisymmetric large-scale flow and the blade rotation. The wakes are well defined and stable at low Rossby number, but they become disordered and interact nonlinearly at Ro of order of 1.

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