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How leakage flow influences the hydrodynamic damping of a vibrating blade[1] MATTHIEU DREYER, ETIENNE CARTIER, STEVEN ROTH, MOHAMED FARHAT, Ecole Polytechnique Federale de Lausanne — The hydrodynamic damping of a structure is of particular importance in many engineering applications. In the case of axial turbines, the presence of a gap between the rotor tip and the shroud induces a leakage flow creating a tip vortex whose roll up process is highly dependent on the clearance size. The blade response to an excitation in the presence of this flow is however poorly characterized. In the present study, the hydrodynamic damping of a Naca hydrofoil in a water tunnel is investigated with respect to the gap width. An innovative device was designed to excite the hydrofoil in non-intrusive way: an underwater electric discharge creates a fast growing and collapsing bubble which generates strong shockwaves. The structural response is monitored with a Laser Vibrometer. Assuming a single degree of freedom system, the hydrodynamic damping for the first two eigen modes (bending and torsion) is identified for different values of upstream velocity, incidence angle and tip clearance size.

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