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**Control of molecular rotation with an optical centrifuge**

ALEKSEY KOROBENKO, University of Ottawa

The main purpose of this work is the experimental study of the applicability of an optical centrifuge – a novel tool, utilizing non-resonant broadband laser radiation to excite molecular rotation – to produce and control molecules in extremely high rotational states, so called molecular “super rotors”, and to study their optical, magnetic, acoustic, hydrodynamic and quantum mechanical properties.