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Radiation torque on an absorptive spherical drop centered on an acoustic helicoidal Bessel beam LIKUN ZHANG, PHILIP L. MARSTON, Washington State Univ. Physics and Astronomy Dept. — Circularly polarized electromagnetic waves carry axial angular momentum and analysis shows that the axial radiation torque on an illuminated sphere is proportional to the power absorbed by the sphere [1]. Helicoidal acoustic beams also carry axial angular momentum and absorption of such a beam should also produce an axial radiation torque [2]. In the present work the acoustic radiation torque on solid spheres and spherical drops centered on acoustic helicoidal Bessel beams is examined. The torque is predicted to be proportional to the ratio of the absorbed power to the acoustic frequency. Depending on the beam helicity, the torque is parallel or anti-parallel to the beam axis. The analysis uses a relation between the scattering and the partial wave coefficients for a sphere in a helicoidal Bessel beam. Calculations suggest that beams with a low topological charge are more efficient for generating torques on solid spheres.

[1] P. L. Marston and J. H. Crichton, Phys. Rev. A. 30, 2508-2516 (1984).
[2] B. T. Hefner and P. L. Marston, J. Acoust. Soc. Am. 106, 3313-3316 (1999).

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