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Radiation force on drops and bubbles in acoustic Bessel beams modeled using finite elements[1] PHILIP L. MARSTON, DAVID B. THIESSEN, LIKUN ZHANG, Washington State Univ. Physics and Astronomy Dept. — Analysis of the scattering of sound by spheres centered on ordinary and helicoidal (higher-order) Bessel beams makes it possible to evaluate the acoustic radiation force on idealized drops and bubbles centered on the beam [1]. For potential applications it would be necessary to know if a small transverse displacement of the sphere from the beam's axis causes a radiation force that pushes the sphere toward (or away from) the axis of the beam. We applied 3D-finite elements to that problem. To trust FEM calculations of the radiation force with helicoidal beams it was first necessary to verify that analytical values for the axial force are recovered in the on-axis helicoidal case since only the zero-order beam had been previously studied with FEM. Cases have been identified where the force pushes a slightly off-set drop or bubble toward the axis. For some cases the effective potential method of Gorkov may be used to predict the transverse stability of small spheres.

[1] P. L. Marston, J. Acoust. Soc. Am. 125, 3539-3545 (2009).

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