Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Biasing left-right particle distribution via sideways bending of the upper body JORGE A. BERNATE, ELEANOR LIN, REBECCA FAHRIG, CARLOS MILLA, GIANLUCA IACCARINO, ERIC S.G. SHAQFEH, Stanford University — The ability to target therapeutic aerosols to specific regions of the lungs would result in more effective treatment of localized pulmonary diseases and may also prove beneficial in systemic delivery via the airways. Previous computational and experimental studies have shown that large particles disproportionately enter the left lung. The observed uneven distribution occurs because the trachea bends to the right just before the first bifurcation, causing particles with sufficient inertia to enter the left main bronchus. Via CT imaging, we have shown that it is possible to modify the normal configuration of the trachea by bending sideways. Bending to the right and left results in configurations in which the trachea monotonically and smoothly bends to the first bifurcation. In the left-bent configuration, inertial particles will tend to accumulate towards the right side of the trachea and enter the right main bronchus, and conversely for the right-bent configuration. In this talk, we will present our results of Large-Eddy simulations and particle tracking showing regional deposition and ventilation as a function of the Reynolds and Stokes numbers for realistic models of the upright and bent configurations of an adult human subject.

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Date submitted: 01 Aug 2014 Electronic form version 1.4