

# AEROSOL DEPOSITION IN LUNG AIRWAYS: OSCILLATORY FLOW CHARACTERISTICS AND PARTICLE DEPOSITION IN AN EXPANDING/CONTRACTING AIRWAY

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Particles suspended in the air enter our respiratory system and cause the health risks depending on particles chemical composition as well as where they deposit within the bronchial tree. Transmission of dangerous particles through the inhalation route is the same as the administration of pharmaceutical aerosols or diagnostic aerosols by inhalation. In drug inhalation therapy, aerosol drug is directly delivered to the region of treatment and it is rapidly absorbed. Hence, the understanding of aerosol deposition in our respiratory system is critical to our health so that we can reduce the deposition of "hazardous" aerosol and enhance the deposition of "beneficial" aerosol in the desired region.

In this project, an experimental investigation was conducted on the behavior of aerosol particles and the characteristics of flow in a single airway of 17<sup>th</sup> generation which has the ability of expanding and contracting sinusoidally to create a periodical flow inside. For this purpose, Particle Image Velocimetry and Particle Tracking Velocimetry techniques are employed silicon oil was used as carrier fluid and iron particles of 1.2 mm and 0.5mm in diameter represented the aerosols. By using silicon oil which has a viscosity of 0.6 Pa s with the iron particles, Reynolds number of particle, Reynolds number of fluid and relative velocity ratio similarities were satisfied simultaneously. By using the necessary instrumentation, synchronization of the system was achieved.

This study is promising in terms of predicting the behavior of aerosol particles under different circumstances such as the instantaneous flow velocity, radial location besides the Reynolds number of the particle.

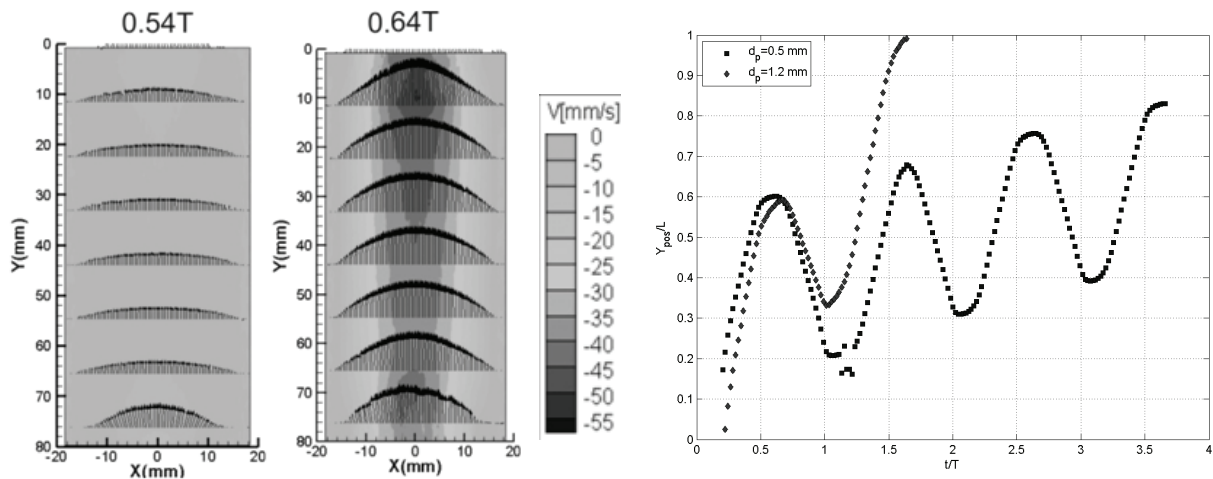


Figure 1: Instantaneous flow field characteristics (Left), Particle trajectory in longitudinal direction for different particle diameters