

# Understanding Air dynamics inside a vacuum chamber

## Abstract

Vacuum becomes an indispensable part in many scientific experimental setup. This is needed to achieve near to ideal ambient condition for the experiments to minimize errors in its operation. The range of vacuum varies from one unit less than atmosphere to  $< 10^{-9}$  units. This variation in vacuum range changes the dynamic range of constituent molecules inside a vacuum chamber. Air we breathe constitutes many gas species in a definite proportion. In a vacuum chamber, before a vacuum pump is switched on the constituent particles remains the same. During evacuation depending on the mass of the gas species the concentration of gas inside the chamber varies due to continuous vacuum pump-down. In LIGO experiment, the dominant gas species are H<sub>2</sub>O and H<sub>2</sub>. Several combination of vacuum pumps are used to reduce concentration of these species inside ultra-high vacuum chambers. In this project, student is expected to calculate percentage concentration of the species as the vacuum range varies. Initial phase of this project involve numerical calculations then next phase will be simulation using available platforms like MATLAB, Python etc.

## Academic Project Requirements:

1) Required No. of student(s) for academic project: 1

2) Name of course with branch/discipline: M.Sc. Physics

3) Academic Project duration:

(a) Total academic project duration: 18 Weeks

(b) Student's presence at IPR for academic project work: 5 Full working Days per week

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