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From Vacuum to Atmosphere: Pressure Front Propagation in Vacuum Tubes

Ultra-high vacuum (UHV) systems are critical in experimental physics and engineering, particularly in projects like the Einstein Telescope (ET), where even minor leaks can affect precision measurements and large leaks can destroy the setup. For this reason, mechanical components such as fast shutters can be used to protect the system. Large leaks can generate pressure fronts propagating at velocities up to 1000 m s^{-1} through evacuated tubes. They can destroy or damage for example: baffles, mirrors or the pipes of the ET. The aim of the setup is to measure the shock waves that comes from major leaks. Therefore, in this experiment, a tube of 3.2 m that has diameter of 52 mm was used in the preliminary setup and it was evacuated to reach 10^{-10} mbar . In this setup, the maximum recorded axial force was 180 N, and it took 4 ms to reach the tube's far end. A space blanket was used to seal the tube from one end and on the other end piezoelectric sensor was fixed. Moreover, the pressure sensor is triggered by an impulse hammer. In this work, we want to describe the technical setup of this experiment, show the first results, and present the future work.

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