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POLDIV – THE AURORA PROBE

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ABSTRACT

The POLar DIVer mission is a CubeSat project proposal focused on studying the phenomena of the polar Aurorae using a Sun-synchronous retrograde polar orbit.

Operating at around a 400 km height (Low Earth Orbit), the POLDIV will pass above the densest layers of the Aurora phenomena both across the Arctic and the Antarctic to study the particle physics of the mid-ionosphere. The payload would consist of a 3U CubeSat, where 1.5U would occupy the power management, the telecommunication, attitude control and thrust systems. The other 1.5U would consist of a 6x6cm cloud chamber, connected to a cascade of two Peltier modules for cooling, DSLR cameras and a thermal management system.

After collecting enough data or upon burn re-entry due to atmospheric drag upon wasting the thrust fuel, the transmitted data would be analysed using the YOLO algorithm and the Open-CV-based automatic track detection to observe the data frame-by-frame and, thus, analyse the Aurora particle environment directly, possibly, upon re-entry, even the Aurora generation environment itself between 100 and 300 kms above the Earth's surface.

This mission would be a pioneering attempt at studying directly the Aurora generation environments using both traditional particle physics experimental methods and combining it with modern automated data analysis tools, making it a valuable resource for studying the Earth's magnetic field and ionosphere.