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Future Electrostatic Accelerometer without Polarization Wire

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ONERA, the French Aerospace Lab

ONERA (the French Aerospace Lab) is developing, manufacturing and testing ultra-sensitive electrostatic accelerometer for space application. Accelerometers have been successfully developed for the Earth-orbiting gravity missions CHAMP, GRACE, GOCE and GRACE-FO and for Earth-orbiting Fundamental Physics mission MICROSCOPE.

In ONERA accelerometer design, the proof mass was levitated and was maintained at the center of an electrode cage by electrostatic forces. Moreover this proof mass was connected by a thin conductive wire (typically 5, 7 or 10 μm diameter wire). This wire allows us to polarize the proof mass and to evacuate the random charges induced by space radiation.

By removing this polarization wire, there will be positive impacts on the accelerometer defaults such as the removal of the parasitic dumping noise at low frequencies created by wire or its bias contribution; but it is important to verify that there are not also negative impacts such as noisy charging process.

After studying the evolution of the space radiation energy distribution on interesting orbits for earth missions, an evaluation of implemented current on the proof mass has been performed. A UV LED had been tested; the set-up and first measurements will be presented. Moreover a prototype is developed by ONERA to characterized charge management capabilities of such a system on a representative environment.