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LONSCAPE: Light Optical Nephelometer Sizer and Counter for Aerosols in Planetary Environments

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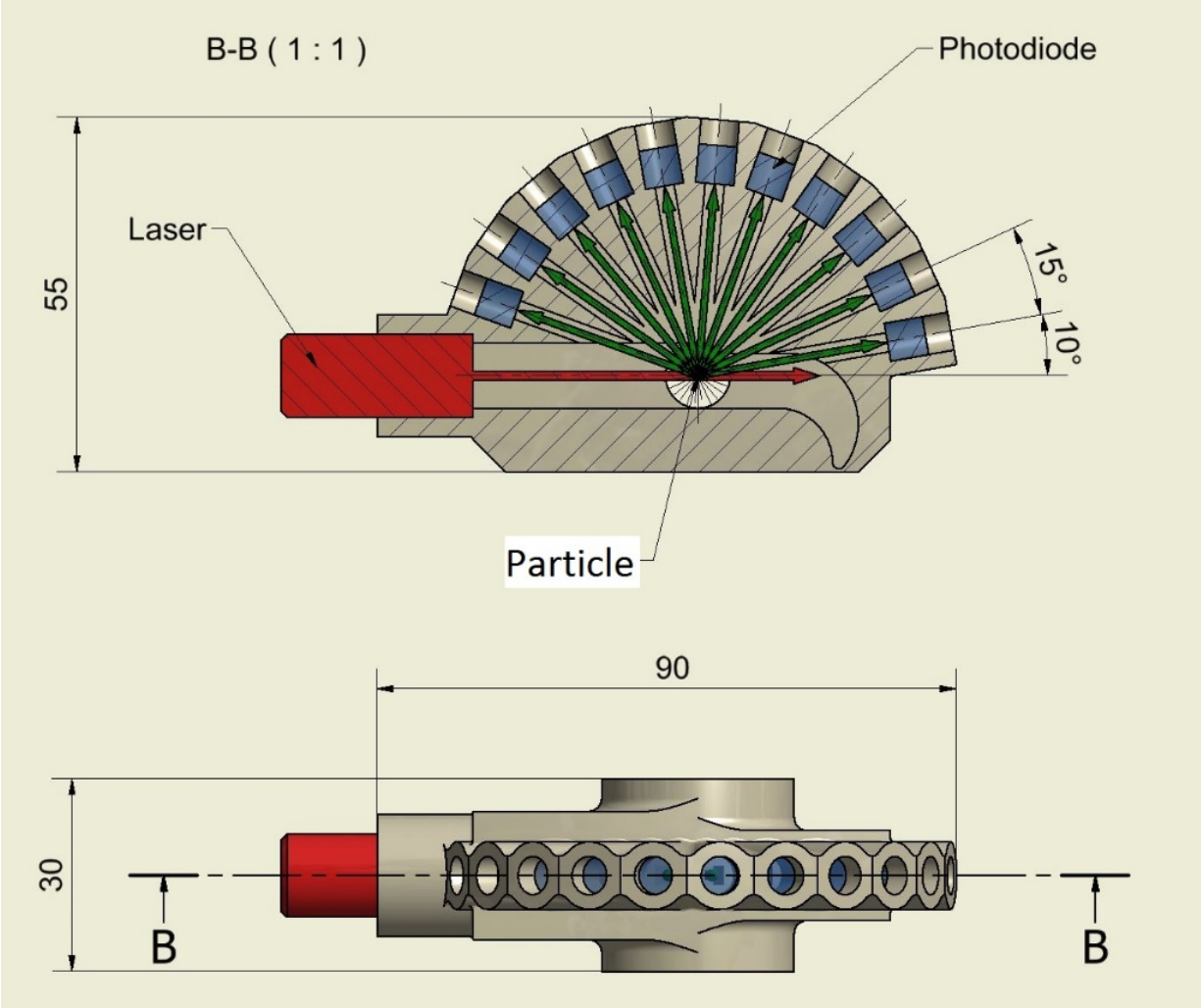
The LONSCAPE - Light Optical Nephelometer Sizer and Counter for Aerosols in Planetary Environments (Renard et al., 2020) has been proposed as a concept combining a particle counter with a nephelometer at several phase angles to characterize the scattering function and obtain precise aerosol properties (see Figure 1).

LONSCAPE is currently considered as part of the science payload of a balloon designed to fly in the Venusian atmosphere (Baines et al., 2021). LONSCAPE has also been proposed to be part of the science payload of several Saturn descent probe concepts submitted to the ESA M4 and M5 calls (Mousis et al., 2016). This instrument is also considered as part of the science payload of an ESA concept of ice giant probe to be carried by a NASA spacecraft (Mousis et al., 2018).

There are currently two major improvements under investigation that could be included to the instrument's design.

The first major improvement is the reduction of the wavelength at which the instrument operates (650-405 nm). Such a change would allow the detection of particles as small as $\sim 0.1 \mu\text{m}$. Detectors tend to be less efficient towards the UV, but the light scattered by diffusion is directly proportional to the ratio d/λ , with d the particle diameter. This leads to more flux recovered towards the blue than in the red, even accounting for detector efficiency (see Figure 2).

The second improvement concerns the shape of the beam. Making use of a thin nappe rather than a dot will increase the counting accuracy by (i) increasing the chance a particle will hit the beam, and (ii) reducing the time it takes to cross it. Both of these points play in favor of counting the smaller, more numerous, particles. This modification is quite favorable to be included to LONSCAPE, as it could significantly enhance its detection capabilities for minimal hardware changes.



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