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A combined Langmuir Probe – fluxgate magnetometer sensor design for Comet Interceptor

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The in situ characterization of space plasmas requires an instrument suite for the measurement of the magnetic and electric fields and waves and of the plasma populations, with the field instruments typically being mounted on booms. This can be a tall order, especially for small planetary science missions, so that one has to seek simplifications. In the context of the Comet Interceptor mission, we have designed a combined sensor that consists of a hollow spherical Langmuir probe that harbors a fluxgate magnetometer at its center. Special precautions have been taken to minimize the possible interference between both, while at the same time being very lightweight. An engineering model has been built and is tested and characterized in detail. Such a combined sensor, together with a companion Langmuir probe, provides data regarding magnetic and electric fields and waves, total ion and electron densities and electron temperature, as well as the ambient nanodust population. It can form the core of an in situ plasma characterization package and offers reference data for the other sensors, such as magnetic field direction, spacecraft potential and total plasma density at high cadence.