



## **Keep-in-Touch meeting (July 21, 2023)**

### **Reflectometry Diagnostics for atmospheric entry applications: state-of-the-art and new developments**

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Insight into the plasma properties of high-speed ionized flows is key for the validation of predictive aerothermodynamic tools for atmospheric entry applications. Plasma radiation will namely be highly dependent on the flow electron densities, which accordingly need to be accurately estimated. We performed an extensive review on past re-entry microwave diagnostics, including both in-flight and ground-test experiments. This work assesses the peculiar characteristics of entry plasmas and derives functional requirements for microwave diagnostics tailored for such applications. A preliminary analysis, including a simulation of electromagnetic environment for the RAM-C II flight experiment, obtained through a CFD code coupled to an electromagnetic propagation code, is presented.

The obtained results outline the adequacy of such diagnostics for improving verification and validation for high-speed entry plasma flows. A compact interferometry/reflectometry was designed and manufactured based on the derived requirements. A first proof-of-concept test was done using a fluorescent lamp as a plasma source. Results showed the equipment's capacity for assess the electron density of non-steady plasma.