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PLANETARY RADIO INTERFEROMETRY AND DOPPLER EXPERIMENT (PRIDE) FOR PLANETARY PROBES

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PRIDE is a multi-purpose, multi-disciplinary enhancement of planetary missions science return, which is able to provide ultra-precise estimates of spacecraft state vectors based on the phase-referenced VLBI (Very Long Baseline Interferometry) tracking and radial Doppler measurements. The Planetary Radio Interferometry and Doppler Experiment (PRIDE) has been developed originally by the Joint Institute for VLBI ERIC (JIVE) for tracking ESA's Huygens Probe during its descent in the atmosphere of Titan in 2005 and since then adopted for a number of planetary science missions. PRIDE is based on exploiting the technique of VLBI originally developed for other than planetary science applications. The essence of the technique is in interleaving observations of the spacecraft radio signal and signal of background natural celestial sources, usually quasars, enabling estimates of the lateral position of the spacecraft in the celestial reference frame and Doppler-shift of the spacecraft's radio signal.

These estimates can be applied to a wide range of research fields including precise celestial mechanics of planetary systems, geophysics and planetary dynamics and measurements of interplanetary plasma properties. PRIDE has been included as a part of the scientific suite on a number of ESA missions.

We present some of the experimental results from achieved by our group over the past decade i.e, on the Huygens Probe in the atmosphere of Titan and the latest results on ESA's Venus EXpress (VEX) and Mars EXpress (MEX) missions. PRIDE was selected by ESA as one of the eleven experiments of the ESA's L-class JUpiter ICy moons Explorer mission (JUICE) mission, scheduled for launch in 2022. It will address those of the prime objectives of the JUICE mission which require precise determination of the lateral position of spacecraft on the celestial sphere.

This poster will also present some of the current & prospective PRIDE targets.The PRIDE approach described in this work proves its applicability to virtually any deep-space mission almost anywhere in the solar system.

Ultimately, PRIDE is an affordable addition to the science output of planetary missions since basically it relies on the instrumentation available onboard spacecraft for other purposes, e.g. communication radio lines.

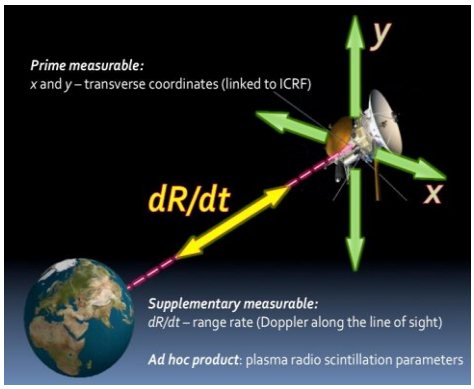

Figure 1: PRIDE Deliverables

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