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Poster

The University of Tasmania (UTAS) operates five large radio telescopes (Hobart-12m, Katherine-12m, Yarragadee-12m, Hobart-26m, and Ceduna-30m) as part of its VLBI-based geodetic, astronomic, and spacecraft tracking activities. We expanded our interplanetary spacecraft tracking capability by conducting radio sounding experiments for the European Space Agency missions. These experiments are conducted within the framework of the Planetary Radio Interferometry and Doppler Experiment on board of the Jupiter Icy Moons Explorer (JUICE) mission, launched in April 2023.

Using the University of Tasmania's VLBI radio telescopes, we monitored the X-band radio downlink signals from Mars Express, Tianwen-1, BepiColombo, Solar Orbiter, and the JUICE missions throughout 2023. Particularly, Mars Express and BepiColombo experienced solar conjunction between October and December. During this campaign, we collected data on phase and frequency scintillation, and the spectral broadening of the carrier signals. Additionally, we observed the transit of a Coronal Mass Ejection across the radio propagation path while both spacecraft. At the time of observation, the angular separation between Mars and the Sun was approximately 4.5 degrees (9 solar radii).

These measurements are essential for characterising turbulent fluctuations in the solar wind at various solar elongations. Very Long Baseline Interferometry (VLBI) observations allow for the measurement of phase fluctuations over the baselines, enabling the inference of plasma parameters including bulk velocity and axial ratio.

In this presentation, we will discuss the results of the solar conjunction and CME transit observations, including their implications for CME structure. We will also present preliminary observations of JUICE and outline plans for this year's campaign.

