

VLBI and Doppler tracking of the VEX and MEX spacecraft and future Martian missions

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Abstract

ESA Venus Express and Mars Express spacecraft were observed with several European VLBI Network (EVN) stations (Metsähovi, Medicina, Matera, Noto, Wettzell and Yebes) in a framework of the Planetary Radio Interferometry and Doppler Experiment project (PRIDE), supported by EVN and Dutch Science Organization (NWO). Observations were carried out either in single- or multi-station mode when the spacecraft were phase locked to the ESA ground station Cebreros. VEX observations were carried out routinely, basically as an Interplanetary Plasma Scintillation study and technical development tests, while MEX observations were timed to the MEX-Phobos flyby event on March 3, 2010. In both cases, we demonstrated the Doppler tracking accuracy at a level of few mHz at few seconds integration. Such a high accuracy of Doppler tracking in the case of MEX-Phobos flyby demonstrated by 3 EVN stations (Metsähovi, Wettzell and Yebes) could help to better determine the Phobos gravity field. In the case of the MEX-Phobos event, the multi-station observations together with phase referencing can provide additional geometrical constrains on the orbiter/Phobos trajectories. PRIDE-EVN observations of the Phobos-Grunt lander, which launch is planned to 2011 are also foreseen.