



## **The mass of Saturn's B-ring from Cassini's Grand Finale orbits**

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Cassini is one of the most successful space missions of all times. Arrived at Saturn in 2004, it collected an enormous amount of scientific data on the atmosphere and the magnetosphere of the gas giant, its icy moons, and its rings. In the final part of journey, ending in a deliberate plunge into Saturn's atmosphere, the spacecraft will collect gravity and magnetic data from a distance as close as 3000 km from the cloud level. Those data are crucial to build interior models of the planet and to determine the depth of zonal winds.

The Cassini radio science investigation will measure Saturn gravity field and the ring mass by means of range rate measurements enabled by the onboard X band (7.2-8.4 GHz) radio system and the antennas of NASA's Deep Space Network and ESA's tracking network. The gravity determination is obtained by fitting the radial velocity of the spacecraft at accuracies of about 0.05 mm/s (at a time scale of 60 s) through predictions obtained from a model of the orbital dynamics.

Cassini orbital geometry is crucial for the gravity experiment. The highly eccentric 6-day orbit has a peri-center close to Saturn's clouds, within the inner edge of the rings. With Cassini passing between the rings and the planet, there is an excellent prospect to disentangle the strong acceleration due to Saturn's oblateness from that due to tiny pull of the rings.

The mass of the rings (concentrated mostly in the B ring) remains uncertain. Its value, generally expressed in terms of Mimas masses, bears crucial information on how and when the rings formed, and their relation with Saturn and its moons. This work presents the final round of simulations of the gravity experiment in Cassini's Grand Finale orbits, using the latest trajectory, spacecraft configuration, and tracking coverage from ground. In particular, we will provide our current best estimate of the accuracy in the ring mass determination, just a few months prior to the actual measurements taking place in six orbits between May and July.