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The NEAR Solar Conjunction Experiment

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The Near Earth Asteroid Spacecraft (NEAR), the first of NASA's Discovery missions was occulted by the disk of the Sun on 18 February 1997. From 7 February 1997 through 3 March 1997, the NEAR telecommunications system was used to carry out a combination of engineering and science measurements as the line of sight of the spacecraft carrier signal approached the solar disk. At a variety of projected radial distances within ~20 solar radii during ingress and egress, experiments were run using the NEAR X-band carrier in both one-way and two-way coherent transmission mode and with multiple Deep Space Network (DSN) 34 m antennas. Phase and amplitude measurements have been made that will permit construction of the coronal electon density and electron density variations (turbulence) along the projected spacecraft trajectory across the sky. Engineering measurements relevant to the real-time downlink for a Solar

Probe
operating at at X-band have also been obtained.
Context has been provided by simultaneous measurements using
the LASCO and UVCS instruments on SOHO as well
as with the X-ray imaging system on YOHKOH.
The experiment has also measured the time delay in the communication
link due to the gravitational field of the Sun by monitoring the
trajectory
of NEAR via Doppler and ranging measurements allowing a measurement
of general relativistic effects.
A description of the measurements made, along with some preliminary
results
and their implications both for our
understanding of the solar corona and for a Solar Probe mission will
be discussed.