

THE HUYGENS DOPPLER WIND EXPERIMENT

The Cassini/Huygens Mission to Saturn/Titan

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Summary

The primary scientific objective of the Doppler Wind Experiment (DWE) on the ESA Huygens Probe is to determine the direction and strength of the zonal winds in the Titan atmosphere. A height profile of wind velocity will be derived from the residual Doppler shift of the Probe's radio relay signal to the Cassini Orbiter, corrected for all known orbit and propagation effects. Wind-induced motion of the Probe will be measured to a precision better than 1 m s^{-1} commencing with parachute deployment at an altitude of ca. 150 km down to the ground (or whatever we may find there on Titan's surface, be it solid or liquid). As secondary objectives, this investigation is also capable of providing valuable information on the Huygens Probe dynamics (e.g. spin rate and spin phase) during the atmospheric descent. The required frequency measurement stability of the radio signal (carrier frequency: 2.04 GHz) is provided by a pair of two Ultra-Stable Oscillators (USO), one to drive the transmitter in the Huygens Probe (TUSO), the other to provide a reference for the special receiver in the Cassini Orbiter (RUSO). The DWE-USOs utilize the well-developed rubidium-based technology of such instruments in order to achieve their required stability quickly and are the first such devices to be flown in deep space. They were designed and manufactured by EADS Astrium (formerly Deutsch Aerospace - DASA) in Ottobrunn, Germany.

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