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An Advanced Water Vapor Radiometer (AWVR) is presently being developed at JPL to support planned science experiments involving NASA's Deep Space Network and the Cassini spacecraft. The AWVR will be used to correct small tropospheric path delay fluctuations on the telemetry link during these experiments. Operating from 22 to 31 GHz, this instrument should achieve a radiometric stability of 10 millikelvin on time scales of several hours without the use of external calibrators. On time scales of clays, a stability of 50 millikelvins is anticipate. The early development effort has focused on the stability of noise diodes as gain calibrators. This talk will present the findings of a year-lcmg effort to demonstrate the needed noise diode stability. The design of a high performance Dicke switch, and the design of the radiometer's thermal enclosure will also be discussed.