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Pioneer Anomaly: Status of New Investigation

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The Pioneer 10/11 spacecraft yielded the most precise navigation in deep space to date. However, their radiometric tracking data received from the distances between 20-70 astronomical units from the Sun has consistently indicated the presence of a small, anomalous, Doppler frequency drift. The drift is a blue frequency shift that can be interpreted as a sunward acceleration of $a_P = (8.74 \pm 1.33) \times 10^{-10} \text{ m/s}^2$ for each particular spacecraft. This signal has become known as the Pioneer anomaly the nature of which remains unexplained. New Pioneer 10 and 11 radio-metric Doppler data recently became available that span a longer interval compared to the data used in previous investigations. A thermal model of the Pioneer vehicles is being developed to study possible contribution of thermal recoil force acting on the two spacecraft. The current status of these investigations will be discussed. This work was carried out at the Jet Propulsion Laboratory, California Institute of Technology under a contract with the National Aeronautics and Space Administration.