

A new Mission to explore the Pioneer Anomaly

H. Dittus (1), C.Lämmerzahl (1), S.G. Turyshev (2), J.D. Anderson (2), U. Johann (3)

(1) Centre of Applied Space Technology and Microgravity (ZARM, University of Bremen, Germany, (2) Jet Propulsion Laboratory, California Institute of Technology, Pasadena CA, U.S.A., (3) Dept. of Science Programmes, Earth Observations and Science, Astrium GmbH, Friedrichshafen, Germany

The inability to explain the so-called Pioneer Anomaly with conventional physics has contributed to growing discussions about its origin. Radio-metric tracking data of the Pioneer 10 and 11 spacecraft and orbit determinations have consistently indicated that at heliocentric distances of about 20 to 70 astronomical units, a small anomalous, blue-shifted Doppler frequency drift occurs. This frequency shift can be interpreted as a constant sunward acceleration of each particular spacecraft of $(8.74 \pm 1.33) \cdot 10^{-10} m s^{-2}$ (Anderson et al. 1998). This signal has become known as the Pioneer Anomaly.

The inability to explain the Pioneer Anomaly with conventional physics as well as the increasing number of proposals to explain it outside conventional physics emphasizes the need for a new experiment. We discuss the recent developments of a mission to explore the Pioneer Anomaly in a dedicated experiment conducted in deep space. This joint European-US mission is motivated by the desire to better understand the laws of fundamental physics as they affect dynamics in the solar system. Experience gained from the Pioneer Spacecraft leads to a creative approach to spacecraft design, like precision formation flying combined with laser ranging.