GR 5: Hauptvorträge Dienstag: Weltraummissionen

Zeit: Dienstag 8:30–10:30 Raum: JUR K

Hauptvortrag GR 5.1 Di 8:30 JUR K

Orbitalsysteme als Plattformen für grundlegende physikalische Experimente — •Hansjörg Dittus — Institut für Raumfahrtsysteme, Deutsches Zentrum f. Luft- und Raumfahrt, Robert-Hooke-Str. 7, D - 28359 Bremen

Seit den Anfängen der Raumfahrt werden auch die Möglichkeiten intensiv diskutiert, sie zur Durchführung neuartiger und hoch präziser Experimente in vielen Bereichen der Physik, insbesondere aber in der Gravitationsphysik, zu nutzen. Mittlerweile existieren aber auch eine Vielzahl an Vorschlägen und konkreten Projekten zu quantenphysikalischen Tests unter den speziellen Bedingungen der Schwerelosigkeit.

Die experimentellen Möglichkeiten auf Satelliten und Plattformen sollen beschrieben und erörtert werden. Laufende Projekte und neueste Projektvorschläge sollen zusammenfassend dargestellt werden. Dabei wird auf die jüngsten technologischen Entwicklungen eingegangen.

Hauptvortrag GR 5.2 Di 9:10 JUR K

LISA and LISA Pathfinder: Gravitational wave astronomy from space — •Karsten Danzmann — AEI Hannover, Max-Planck Institut für Gravitationsphysik und Universität Hannover, Callinstr. 38, 30167 Hannover

The low-frequency part of the gravitational wave spectrum, from 100 micro-Hertz up to 1 Hz, contains the most spectacular sources of gravitational waves. Really high precision measurements are possible here, making this frequency range very interesting for both Astronomy and Fundamental Physics.

LISA, the Laser Interferometer Space Antenna, will comprise three satellites at the corners of an equilateral triangle with 5 Million km armlength. The constellation is inclined against the ecliptic by 60 degrees, following behind the earth in a distance of 50 Million km. Each satellite contains free-flying test masses on almost perturbation-free geodesic lines. Changes in the distances between the test masses will be measured by heterodyne laser interferometry with picometer resolution to detect the spacetime curvature caused by passing gravitational waves. LISA as a collaborative ESA/NASA mission is the most promising candidate for the L1 slot in the Cosmic Visions program of ESA with a launch in 2020. The Beyond Einstein Program Assessment Committee of NASA has just recently recommended LISA as a flagship mission for NASA.

Key technologies for LISA will be demonstrated on the precursor mission LISA Pathfinder, to be launched by ESA in 2012. Flight hardware manufacture for LISA Pathfinder has begun.

Hauptvortrag GR 5.3 Di 9:50 JUR K

Towards a One Percent Measurement of Frame Dragging by Spin with Satellite Laser Ranging to LAGEOS, LAGEOS 2 and LARES and GRACE Gravity Models — •Ignazio Ciufolini[1], Antonio Paolozzi[2], Erricos Pavlis[3], John Ries[4], Rolf Koenig[5], Richard Matzner[6], Giampiero Sindoni[2], and Hans Neumayer[5] — [1]University of Salento and INFN, Lecce, Italy — [2]Sapienza University of Rome, Scuola di Ingegneria Aerospaziale, Rome, Italy — [3]University of Maryland, Baltimore County, Baltimore, USA — [4]University of Texas at Austin, Center for Space Research, Austin, USA — [5]GFZ German Research Centre for Geosciences, Potsdam, Germany — [6]University of Texas at Austin, Center for Relativity, Austin, USA

During the past century Einstein's theory of General Relativity gave rise to an experimental triumph; however, there are still aspects of this theory to be measured or more accurately tested. Today one of the main challenges in experimental gravitation, together with the direct detection of gravitational waves, is the accurate measurement of the gravitomagnetic field generated by the angular momentum of a body. Here, after a brief introduction on frame-dragging and gravitomagnetism, we describe the measurements of frame-dragging by the Earth spin, with an accuracy of approximately 10%, using the satellites LAGEOS, LAGEOS 2 and the Earth's gravity models obtained by the GRACE project. We then present the LARES experiment to be launched in 2010 by the Italian Space Agency for a measurement of frame-dragging with an accuracy of a few percent.