

GR 17: Experimental tests II

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Raum: Phys-SR-SE1

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The Gravitational Field of a Laser Beam of Gaussian Profile— ●FABIENNE SCHNEITER¹, DENNIS RÄTZEL², and DANIEL BRAUN¹ —¹Institut für Theoretische Physik, Eberhard-Karls-Universität Tübingen, 72076 Tübingen, Germany — ²Faculty of Physics, University of Vienna, Boltzmannngasse 5, 1090 Vienna, Austria

We investigate the gravitational properties of light for the case of a laser beam with Gaussian profile. Such Gaussian beams are approx-

imate solutions of the Helmholtz equation valid under the condition of small beam divergence. We start from an expansion of the vector potential in orders of the divergence angle and derive the perturbation of the spacetime metric induced by the beam and the corresponding spacetime curvature to the same order. Calculating the geodesics, we analyze the motion of massive test particles at rest as well as the motion of test rays of light. The results are compared to well-known cases such as the infinitely thin beam of light first investigated in the seminal paper by Tolman et al.