

Dynamics of a point scalar charge in curved spacetime

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Abstract

The reaction of a system of moving masses to the loss of energy and angular momentum to gravitational radiation is a fascinating topic of investigation that is made timely by the near-future detection of gravitational waves. In this talk I will introduce a toy model that involves a point particle moving in a curved spacetime and carrying a scalar charge. In an analogy with the actual physical system, this moving charge emits scalar radiation and the particle's motion is affected by a (self-produced) radiation-reaction force. After introducing coordinate systems that are especially well suited for this purpose, I will describe the (singular) behaviour of the scalar field in the vicinity of the charge, and show how this field can give rise to a well-defined radiation-reaction force acting on the particle. Finally, I will show that scalar charges can radiate their rest mass, an effect that is also incorporated in the particle's equations of motion.