ABSTRACT

RADIATION ARISING FROM THE RINDLER GRAVITATIONAL BACKGROUND

Unruh radiation is the thermal flux seen by an accelerated observer moving through empty space. In this manuscript we summarize the field theory calculation that led to this result in order to support the derivation of Unruh radiation using WKB-like methods. We first introduce two different metrics that describe the spacetime seen by the accelerated observer, including the standard Rindler metric, and we also discuss the subtleties associated with each metric. To carry out the semi-classical calculation, we place a scalar field in the Rindler metric and use the Hamilton-Jacobi equations for the scalar field to solve for the action of the field. The radiation will be obtained by calculating the field's tunneling rate across the horizon. As it has been shown, the gravitational WKB-like problem has some distinct features as compared to the ordinary quantum mechanical WKB problem: (i) the tunneling rate strictly should be written as the closed path integral of the momentum, and (ii) there is a time-like contribution to the decay rate arising from the change of signature of the metric because of the crossing of the horizon. This temporal contribution to the tunneling rate has no analog in the ordinary quantum mechanical WKB calculation.

Andrea Arias de Gill
August 2009