ON PARTICLE PRODUCTION, NEGATIVE ENERGY FLUX AND ACCELERATION HORIZONS

M. R. R. Good[*], **G. Akhmetzhanova**

School of Science and Technology, Nazarbayev University, Astana, Kazakhstan; *michael.good@nu.edu.kz

Introduction. In the moving mirror model, removal of acceleration horizons gives rise to negative energy flux. The total emitted energy is positive and finite, in agreement with quantum inequalities and the second law of thermodynamics [1]. Exact solutions to the moving mirror model have been found which demonstrate this rare effect.

Methods. Moving mirrors which do not accelerate forever lack horizons [2]. Pathological acceleration singularities are absent in mirrors that are allowed to become inertial in the far future. Interestingly, asymptotically inertial mirrors emit negative energy flux. Exact analytical examples of the moving mirror model are solved, i.e. the number of particles created and the total energy is obtained. This is done by solving for the Bogoliubov coefficients and the stress energy tensor respectively [3].

Results and discussion. One solution to the moving mirror problem was found which emits a characteristic positive energy burst, a thermal plateau, and negative energy flux. Particle production was examined during the motion. Negative energy emission does not result in negative particle production. The characteristic positive energy flare is mimicked in the particle outflow.

Conclusions. Negative energy flux can be emitted without null asymptotes. In fact, those examples studied here have no null asymptotes, and each one provides negative energy emission. Moreover these trajectories do not ultimately collide with the observer. These results confirm negative energy emission in the absence of unphysical motion corresponding to infinite asymptotic acceleration or contact of the mirror with the detector.

References.

1. Walker, W.R. Negative Energy Fluxes and Moving Mirrors in Curved Space. Class. Quant. Grav., 2:L37, 1985.

2. Good, M.R.R. et al. Time Dependence of Particle Creation from Accelerating Mirrors. Phys. Rev. D. 88, 2013.

3. Davies, P.C.W. and S. A. Fulling. Radiation from a moving mirror. Proc. Roy. Soc. Lond., A348:393-414, 1976.