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# Particle Creation by a Black Hole as a Consequence of the Casimir Effect

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**Abstract.** Particle creation by a black hole is investigated in terms of temperature corrections to the Casimir effect. The reduction of the Hawking effect to more familiar effects observed in the laboratory enables us to reveal the mechanism of particle creation. The blackbody nature of the Hawking radiation is due to the interaction of virtual particles with the surface of a "cavity" formed by the Schwarzschild gravitational field potential barrier. These particles are "squeezed out" by the contraction of the potential barrier and appear to an observer at $J^+$ as the real blackbody ones.

In the previous papers [2–4] a programme of reduction of particle creation by a black hole to quantum- field effects in flat space-time was initiated. The programme is based on the fact that the gravitational field of a black hole creates an effective potential barrier penetrable for the high-frequency waves and impenetrable for waves with low-frequency. The barrier is so well-localized near $r=1.5\,Rg$ ($Rg=+2GM/c^2$) that for a study of wave propagation we can consider the regions quite near the horizon and far away from it as "flat". All the scattering takes place in the small region near $r=1.5\,Rg$. The consideration of the barrier peak ($r=1.5\,Rg$) as a surface of the reflecting sphere permitted to apply to a black hole the results of various Casimir-effect calculations. It appeared [2] that the flow of negative Casimir energy should cause the area of the horizon to shrink at a rate consistent with the energy flux observed at future infinity $J^+$. But the model appeared to be too primitive providing only qualitative agreement with Hawking's results [1].

Hence the second stage of the programme had to be carried out [3]. It consisted in creation of a more sophisticated model capable of demonstrating that the two properties of a black hole – the horizon and the potential barrier – together are necessary and sufficient to compel the hole to produce thermal radiation at a temperature that exactly coincides with the result of Hawking. Namely that was done by means of the reduction of the evaporation effect to that of particle creation by (non-uniformly) accelerated mirrors.