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## Hawking-like radiation from gravitational Bremsstrahlung beyond the Planck scale

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We derive the limiting form of graviton radiation in gravitational scattering at transplanckian energies ( $E \gg M_P$ ) and small deflection angles. We show that – owing to the graviton’s spin 2 – such limiting form unifies the soft- and Regge- regimes of emission, by covering a broad angular range, from forward fragmentation to deeply central region. The single-exchange emission amplitudes have a nice expression in terms of the transformation phases of helicity amplitudes under rotations. As a result, the multiple-exchange emission amplitudes can be resummed via an impact parameter  $b$ -space factorization theorem that takes into account all coherence effects. We then see the emergence of an energy spectrum of the emitted radiation which, being tuned on  $\hbar/R \sim M_P^2/E \ll M_P$ , is reminiscent of Hawking’s radiation. Such a spectrum is much softer than the one naively expected for increasing input energies and neatly solves a potential energy crisis. Furthermore, by including rescattering corrections in the (quantum) factorization formula, we are able to recover the classical limit and to find the corresponding quantum corrections. Perspectives for the extrapolation of such limiting radiation towards the classical collapse regime (where  $b$  is of the order of the gravitational radius  $R$ ) are also discussed.

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