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(G*) Hawking Corrections from Universal Planck Scale Physics

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Caustics are regions of high intensity created generically by the natural focusing of waves, and are universally described by catastrophe theory. Each distinct class of catastrophe is uniquely described by its own diffraction pattern, the simplest two being the Airy and Pearcey functions. A more exotic form of *logarithmic* wave singularity occurs near event horizons, which have acoustic analogues in quantum fluids such as Bose-Einstein condensates where Hawking radiation can be simulated. In such systems logarithmic singularities are regulated by taking into account non-linear dispersive effects, and are properly described by an Airy-type wave function supplemented by a logarithmic phase term. We find the presence of additional sub-dominant waves not yet predicted near the horizon. Furthermore, the horizon and the caustic do not in general coincide; the finite spatial region between them delineates a broadened horizon. Our catastrophe theory motivated approach allows us to comment on the stability/universality of inter-atomic length scale corrections to the Hawking spectrum (analogous to Planck scale corrections for gravitational Hawking radiation).

Keyword-1

Analogue gravity

Keyword-2

Hawking radiation

Keyword-3

Bose-Einstein condensates

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