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Laboratory analogues of black hole evaporation and its partner particles

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Many quantum radiation phenomena such as black hole evaporation (Hawking effect) are far removed from experimental access.

Therefore, analogies between these fundamental phenomena and laboratory physics can help to understand both sides better – from a theoretical as well as from an experimental point of view.

This talk will start with a brief introduction into black hole evaporation with special emphasis on the issue of the partner particles of Hawking radiation. As such quantum radiation phenomena can be described as (squeezing) processes where particles are created in pairs, one can ask the following question: given a mode (e.g., wave-packet) corresponding to a created particle (e.g., as part of Hawking radiation), what is its partner, i.e., the other particle of the pair?

After a general derivation of this partner mode, examples such as moving mirror radiation and black hole evaporation will be discussed, together with speculations about possible implications for the black hole information puzzle.

After an introduction into the laboratory analogues of black hole evaporation, the second part of the talk will be devoted to the question of what can be learned from them about the origin and the robustness of Hawking radiation and its partner particles.

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