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Volume Concepts in the Thermodynamics of Black Holes

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Volume is a coordinate-dependent quantity in General Relativity. Therefore, when it comes to thermodynamics of black holes, volume and its conjugate pressure are not used as thermodynamic variables. In this presentation we study how different types of volume concepts can be used in black hole descriptions in a thermodynamically consistent way and show the consequences taking results from literature into account. We study especially the phase structure of Anti-de Sitter–Kerr type black holes and their Hawking–Page phase boundaries. The main aim of this project is to find out how one can put the thermodynamic volume piece into place in the great puzzle of the theory of black holes.

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