

## Spanish and Portuguese Relativity Meeting



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# Black hole binaries in an expanding Universe

*Friday 26 July 2024 11:00 (40 minutes)*

According to the  $\Lambda$ -Cold Dark Matter ( $\Lambda$ CDM) model, a positive cosmological constant explains the accelerated expansion of the Universe. We start by constructing a static solution of general relativity with a positive cosmological constant that consists of two (or more) static black holes whose gravitational attraction is balanced by the cosmic expansion of the de Sitter background. Then, we extend our analysis and establish the existence of stationary, spinning black binaries in a de Sitter universe and analyse their properties (there is no quadrupole momenta, no radiation). We consider identical black holes with either aligned or anti-aligned spins which maximize the spin-spin repulsion or attraction, respectively. We discuss the prospect that spin-spin interactions can stabilize the binaries. Our solutions establish continuous non-uniqueness in general relativity without matter (we have several solutions with the same cosmological entropy and angular momentum) for the first time in four dimensions. They evade assumptions of mathematical theorems that would otherwise rule out their existence. They also provide initial data for the spinning binary merger problem (when orbital angular momentum is added).

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