

The complex conformal Kähler structure of type-D spacetimes

Saturday, 7 November 2026 17:30 (30)

This is a work about the complex conformal Kähler structure and the related duality symmetry of Plebański-Demiański class, a kind of type-D spacetime. We reviewed the complex metric and complex Kähler structure of complex spacetimes, which has the complex valued metric and almost complex structure as well as the related potential function. We find a $SO(2, C)$ duality transformation of Kerr-Taub-NUT class which maps Kerr metric into Taub-NUT metric continuously. What's more, using the results above, we get a Monge-Ampère equation which is equivalent to the vacuum Einstein equations and the solution of it contains the whole Plebański-Demiański Class, and theoretically the type-D spacetimes. Then we use toric reduction to obtain some moment polytopes and then use this one can classify different type-D solutions based on the complex conformal Kähler structure. We also find a complex Monge-Ampère equation and one can obtain the whole type-D by solving it. This is a joint work with Prof. Lars Andersson.

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Session Classification : Parallel-Gravity