

Contribution ID: 63

Type: Talk/Seminar

## The solution to the Petrov type D equation on the non-trivial bundle topology and its embeddability

Monday 23 September 2019 15:20 (20 minutes)

We consider 3-dimensional isolated horizons (IHs) generated by null curves that form non-trivial U(1) bundles and the Petrov type D equation. From the 4-dimensional spacetime point of view, solutions to that equation define isolated horizons embeddable in vacuum spacetimes (with cosmological constant) as Killing horizons to the second order such that the spacetime Weyl tensor at the horizon is of the Petrov type D. From the point of view of the U(1)-bundle structure, the equation couples a U(1)-connection, a metric tensor defined on the base manifold and the surface gravity in a very non-trivial way. We focus on the U(1)-bundles over 2-dimensional manifolds diffeomorphic to 2-sphere. We have derived all the axisymmetric solutions to the Petrov type D equation. For a fixed value of the cosmological constant they set a 3-dimensional family as one could expect. A surprising result is, that generically our horizons are not embeddable in the known exact solutions to Einstein's equations. It means that among the exact type D spacetimes there exists a new family of spacetimes that generalize the properties of the Kerr- (anti) de Sitter black holes on one hand and the Taub-NUT spacetimes on the other hand.

Authors: Prof. LEWANDOWSKI, Jerzy (University of Warsaw); ISVAN, Racz; DOBKOWSKI-RYŁKO, Denis

Presenter: DOBKOWSKI-RYŁKO, Denis

Session Classification: Parallel Sessions

Track Classification: Parallel Sessions