
ROBERT MILSON, Dalhousie University

The type N Karlhede bound is sharp

We present an example of a family of four-dimensional Lorentzian manifolds whose invariant classification requires the seventh covariant derivative of the curvature tensor. The spacetimes in questions are null radiation, type N solutions on an anti-de Sitter background. The upper bound of 7 on the order of the covariant derivative, was first established by Karlhede, about 30 years ago. Thanks to this result, we now know that this bound is sharp. The key technique for the search of such anomalous spacetimes is the property of curvature homogeneity, meaning that the tetrad components of the Riemann curvature tensor and its covariant derivatives up to a certain order can be taken to be constant.