GEOMETRY OF COMPACT LORENTZIAN MANIFOLDS WHOSE ISOMETRY GROUP HAS NON-COMPACT CONNECTED COMPONENTS

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In our first talk, we described the Lie algebra of groups acting isometrically and locally effectively on Lorentzian manifolds of finite volume. We use this classification now to obtain a geometric characterization of compact Lorentzian manifolds whose isometry group has non-compact connected components.

We will show that they are either covered isometrically by a warped product of the universal cover of the two-dimensional special linear group, provided with the metric defined by its Killing form, with a Riemannian manifold, or by certain twisted products of twisted Heisenberg groups and Riemannian manifolds.

In the homogeneous case, the description is easier and the corresponding Riemannian manifold is compact and homogeneous as well.

This structure allows to determine the local geometry of compact Lorentzian manifolds whose isometry group has non-compact connected components. We will shortly sketch the ideas behind the calculation of the curvature and say why the isometry group of compact Ricci-flat Lorentzian manifolds has compact connected components. If the manifold is additionally non-flat, the isometry group is even compact.