On the classification of Lorentzian r-th symmetric spaces

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Locally symmetric spaces are characterized by the vanishing of the covariant derivative of its curvature, $\nabla R = 0$. According to a classical Riemannian result, the vanishing of a higher order derivative implies the vanishing of the first one. Nevertheless, such a result does not hold in arbitrary signature and, so, *r-th symmetric spaces* are defined by

$$\nabla^{(r)}_{\cdots}\nabla R = 0.$$

Proper examples can be found in the well-known family of relativistic *plane waves*. Our aim is to explain the geometric properties and recent classification of 2nd-symmetric Lorentzian spaces, as well as to explore the possibilities for higher order, following recent work in collaboration with OF Blanco and JMM Senovilla, arxiv: 1101.5503.