Title: On the Gauss map of minimal Lorentzian surfaces in 4-dimensional semi-Riemannian space forms with index 2

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In this paper, we study minimal Lorentzian surfaces with finite type Gauss map in 4-dimensional semi-Riemannian space forms with index of 2. First, we give the complete classification of Lorentzian surfaces in the semi-Euclidean space $\mathbb{E}^4_2$ with pointwise 1-type Gauss map. Then, we study all Lorentzian minimal surfaces in $\mathbb{S}^4_2(1)$ regarding their Gauss map. In particular, we proved that a Lorentzian minimal surface in $\mathbb{S}^4_2(1)$ has 2-type Gauss map if and only if it has constant Gaussian curvature and non-zero constant normal curvature.

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