

Spacelike surfaces with positive definite second  
fundamental form in 3-dimensional  
Lorentzian manifolds

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**Abstract**

For a spacelike surface with positive definite second fundamental form in any 3-dimensional Lorentzian manifold, a new formula relating its mean and Gauss curvature with the Gauss curvature of the second fundamental form is shown. Several applications are then obtained. Thus, necessary and sufficient conditions are established in order to get that such a compact spacelike surface is totally umbilical. In particular, it is shown that the totally umbilical round spheres are the only compact spacelike surfaces in the 3-dimensional de Sitter space such that the second fundamental form is nondegenerate and has constant Gaussian curvature.