Schimming, Rainer

**Lorentzian geometry as determined by the volumes of small truncated light cones.** (English)

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Arch. Math., Brno 24, No. 1, 5-15 (1988).

Let (M,g) be a Lorentzian manifold and C(y,a) the truncated light cone with vertex $y \in M$, axis the timelike vector a and altitude $|a| = g(a,a)^{1/2}$. Let Vol C(y,a) be the volume of C(y,a) with respect to the invariant Riemannian measure of (M,g). For $M = \mathbb{R}^{n+1}$ and g the Minkowski metric, let C(a) be the corresponding truncated light cone with $y = 0$. The main result of the work is the following: "A Lorentzian manifold (M,g) of dimension $n + 1 \geq 3$ is flat if and only if

$$VolC(y,a) = VolC(a)(1 + o(|a|^5))$$

for sufficiently small altitudes a of C(y,a). (M,g) is Ricci-flat if and only if

$$VolC(y,a) = VolC(a)(1 + o(|a|^3)).''$$

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**MSC:**

53B30 Local differential geometry of Lorentz metrics, indefinite metrics



**Keywords:**

Lorentzian manifold; truncated light cone; volume; flat; Ricci-flat

**Full Text:** EuDML