Kay, Bernard S.

Quantum fields in curved spacetime: non global hyperbolicity and locality. (English)

Zbl 0918.53027

Doplicher, S. (ed.) et al., Operator algebras and quantum field theory. Proceedings of the conference dedicated to Daniel Kastler in celebration of his 70th birthday, Accademia Nazionale dei Lincei, Roma, Italy, July 1–6, 1996. Cambridge, MA: International Press. 578-588 (1997).

The usual axiomatic scheme for quantum field theories on a curved spacetime (M, g) is applicable only if at least strong causality holds on (M, g). This implies, in particular, that it is in general not clear how a quantum field theory should be formulated on spacetimes with chronology violations (i.e., spacetimes with "time machines"). To overcome this problem, it was proposed earlier by the author [*B. S. Kay*, Rev. Math. Phys., Spec. Issue, 167-195 (1992; Zbl 0779.53052)] to replace the locality axiom (i.e., local algebras $\mathcal{A}(\mathcal{O}_1)$ and $\mathcal{A}(\mathcal{O}_2)$ commute if the corresponding regions $\mathcal{O}_1, \mathcal{O}_2 \subset M$ are spacelike separated) by the "F-locality condition". This means basically that locality is assumed only for field theories defined appropriately on globally hyperbolic subspacetimes of (M, g).

The present paper reviews the basic ideas behind F-locality and discusses some recently published consequences [*B. S. Kay, M. J. Radzikowski* and *R. M. Wald*, Commun. Math. Phys. 183, 533-556 (1997; Zbl 0883.53057)].

For the entire collection see [Zbl 0889.00022].

Reviewer: Michael Keyl (Braunschweig)

MSC:

53Z05	Applications of differential geometry to physics
81T20	Quantum field theory on curved space or space-time backgrounds
81T05	Axiomatic quantum field theory; operator algebras

Keywords:

quantum field theory; curved space-time; chronology violations; F-locality; time machine