Gonnella, Guiseppe; **Kay, Bernard S.**
Can locally Hadamard quantum states have nonlocal singularities? (English) ｜Zbl 0678.53082｜
Classical Quantum Gravity 6, No. 10, 1445-1454 (1989).

Investigations concerning the problem of renormalising the quantum energy-momentum tensor in a curved spacetime together with other considerations strongly suggest, that one ought to restrict attention to states whose two-point functions locally have the Hadamard form. With the local Hadamard condition, only those states will be allowed which have the correct short distance behavior. However, it is possible, that one could have a locally Hadamard (LH) state whose unsmeared anticommutator function G(x,y) is singular not only at $x = y$ but also for certain singular pairs $(x_{\sin g}, y_{\sin g})$ with $x_{\sin g} \neq y_{\sin g}$ (the issue of non-local singularities (NLS) to refer to this case).

The linear quantum massive scalar field theory is considered on a globally hyperbolic spacetime. Two examples of LH weak bisolutions with NLS are investigated. One class of such examples is a real scalar massive field in flat spacetime $(\mathbb{R}^4, \eta)$. A second type of example is obtained for spacetimes (e.g. Minkowski space) which can be viewed as covering spaces of non-simply connected spacetimes (e.g. cylinder spacetime) and unwrapping the anticommutator function for a natural quantum state on the latter. It is shown that each of the examples considered fails to arise as the anticommutator function of quantum state. Thus the conjecture follows: the LH quantum states have not the NLS.

Reviewer: O.M.Boyarkin

MSC:

53C80	Applications of global differential geometry to the sciences
81T20	Quantum field theory on curved space or space-time backgrounds
83C47	Methods of quantum field theory in general relativity and gravitational theory

Cited in **8** Documents

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