Quantum expectation values on black hole space-times

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The renormalized expectation value of the stress energy tensor (RSET) is an object of central importance in quantum field theory in curved space-time, but calculating this on black hole space-times is far from trivial. The standard methodology was developed in the 1980s and 1990s and successfully applied to a range of quantum fields on Schwarzschild black holes. The subject received an impetus in the last few years with to the development of two novel approaches to these computations, which have enabled applications to a wider range of black hole space-times. In this talk we will focus on the simpler renormalized vacuum polarization of a quantum scalar field, outlining these new methodologies and reviewing some of the results of recent computations of this expectation value.