**Recent Progress on the Probability of Quantum Stress Tensor Fluctuations and its Applications**

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This talk will review recent results on the probability distribution for the vacuum fluctuations of time and space averaged quantum stress tensor operators. This distribution has been found to fall very slowly for large fluctua-tions, as an exponential of a small fractional power of the dimensionless stress tensor. This result was first found for time averages using the rate of growth of moments, and more recently confirmed using a numerical diagoni-zation procedure. It has also been extended to the case with both space and time averaging. Some physical ef-fects which might arise from the enhanced fluctuations will be discussed. These include increased rates for bar-rier penetration by quantum particles and for false vacuum decay in field theory.