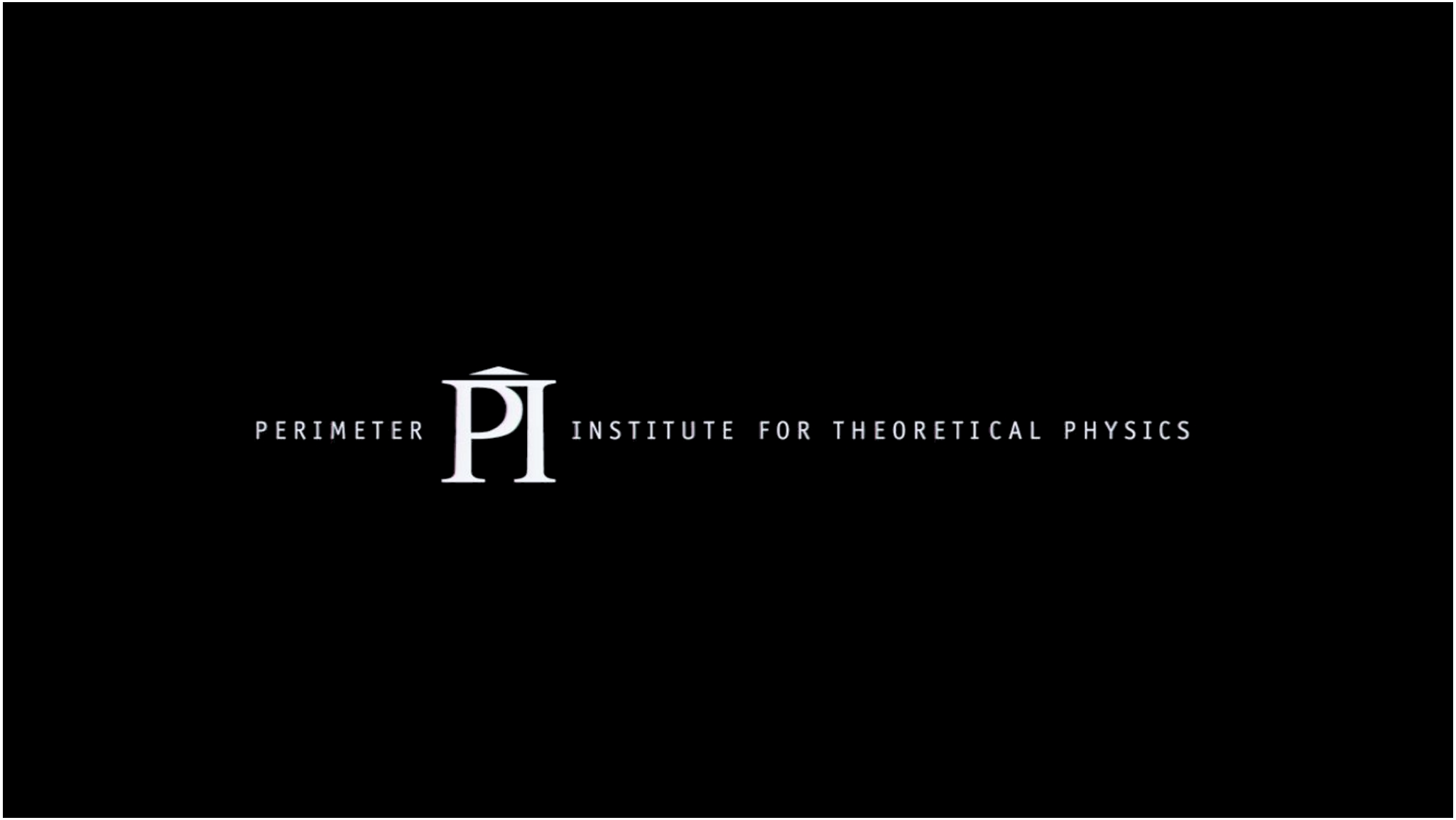
Title: Quantum limits for measurement of the metric tensor

Date: Dec 01, 2010 02:00 PM

URL: http://pirsa.org/10120053

Abstract: Tony Downes
The geometry of space-time can only be determined by making measurements on physical systems. The ultimate accuracy achievable is then determined by quantum mechanics which fundamentally governs these systems. In this talk I will describe uncertainty principles constraining how well we can estimate the components of a metric tensor describing a gravitational field. I shall outline a number of examples which can be easily constructed with a minimum of mathematical complexity. I will also attempt to derive a general bound on the uncertainty in any attempt to determine the metric tensor which is expected to hold in an arbitrary globally hyperbolic space-time. I shall use tools developed within the algebraic approach to quantum field theory on a classical space-time background. I shall not consider limits on estimating space-time metrics that might arise from a quantisation of gravity itself.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