

# On the problem of emergence of classical space-time: The quantum-mechanical approach

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## Abstract

The classical space-time structure is derived from the structure of an abstract infinite dimensional separable Hilbert space  $S$ . For this  $S$  is first realized as a Hilbert space  $H^*$  of functions of abstract parameters. Such a realization is associated with the process of measuring position of macroscopic particles naturally occurring in the universe. The process of decoherence and collapse induced by the measurement is in return associated with the choice of a "decohered" submanifold  $M$  of realization  $H^*$ . The submanifold  $M$  is then identified with the classical space-time. The mathematical formalism is developed which permits to recover the usual Riemannian geometry on space-time in terms of the Hilbert structure on  $S$ . The specific functional realizations of  $S$  are shown to produce space-times of different geometry and topology.

**Keywords:** Emergence, generalized functions, Hilbert space

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