Q 16 Hauptvorträge II

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Quantum entanglement and quantum communication — •Pawel Horodecki — Gdansk University of Technology, Narutowicza 11/12, 80-952 Gdansk, Poland

The rapidly developing theory of mixed states entanglement is briefly reviewed. The central role of pure quantum entanglement as a resource in distributed quantum systems (within so called distant labs paradigm) is underlined. The idea of distillation of mixed quantum entanglement to a pure form is outlined. Some of mixed entangled states happen to represent so called bound (nondistillable) entanglement representing peculiar phenomenon of irreversibility in quantum correlations domain.

Application of entanglement distillation idea to quantum information channels is presented. In the case of channels with many receivers the +surprising effect of drastic nonadditivity of channel capacities is described. The question of cryptografic security of given quantum channel is analysed and it is shown that there are channels that have zero quantum information capacity but high cryptografic security capacity. The effect is based on nontrivial protocol of receiving secure cryptographic key from bound entanglement.