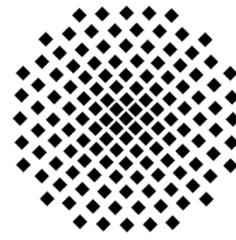


Stuttgarter Physikalisches Kolloquium

Fachbereich Physik, Universität Stuttgart
Max-Planck-Institut für Festkörperforschung
Max-Planck-Institut für Intelligente Systeme

Ansprechpartner: Prof. Harald Giessen
E-Mail: giessen@physik.uni-stuttgart.de
Telefon: 0711 - 685-65111



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17:15 Uhr

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Universität Stuttgart, Pfaffenwaldring 57, 70569 Stuttgart-Vaihingen

Gastgeber: Prof. Peter Michler, Universität Stuttgart, Telefon: 0711 - 685-64660

Event-ready loophole free Bell tests and beyond

Harald Weinfurter
LMU München

Abstract

An experimental test of Bell's inequality allows to test the validity of local-realistic descriptions of nature by measuring correlations between distant systems. While such tests are conceptually simple, there are strict requirements concerning the detection efficiency of the involved measurements, as well as the enforcement of space-like separation between the measurement events. Only recently both loopholes could be closed simultaneously.

Here we present our approach based on combining heralded entanglement of atoms separated by 398 m with fast and efficient measurements of the atomic spin states. We obtain a violation $S=2.22 \pm 0.033 > 2$, which allows us to refute the hypothesis of local-realism with very high significance.

The mere fact that local hidden variables can be enabled us to design protocol in quantum communication testing the existence of any possible information about the communication. We discuss the benefits and requirements for the experiment of such so called device independent communication schemes.