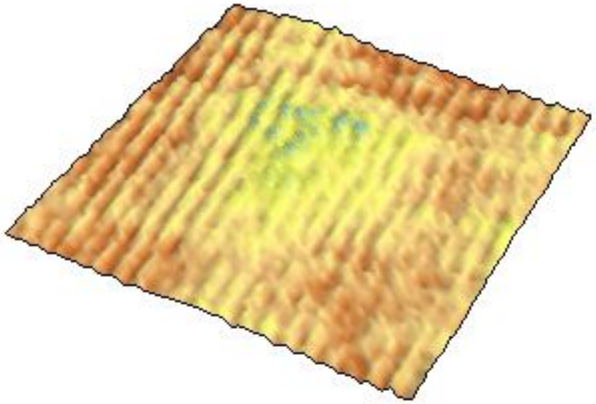
Optik mit ultrakalten Atomen



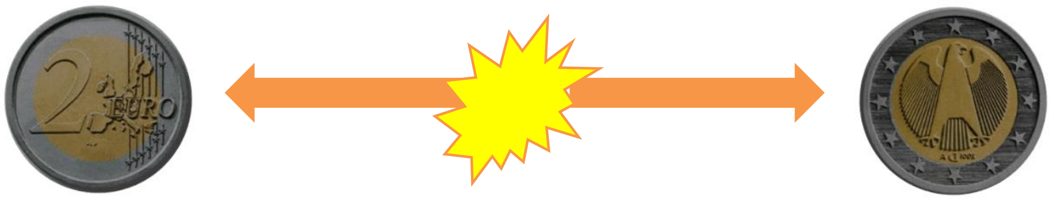
Carsten Klempt

Wolfgang Ertmer

Institut für Quantenoptik

Verschränkte Atome

Deterministisches Bild



oder

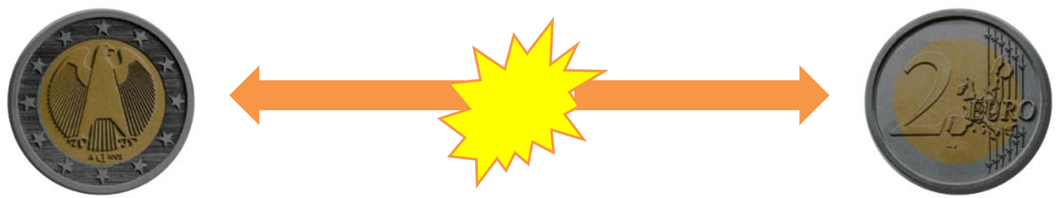
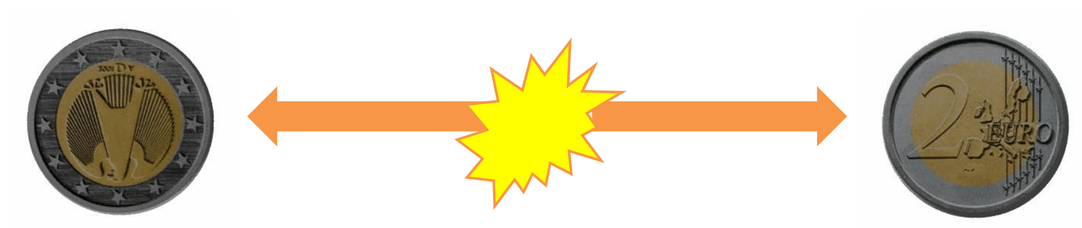
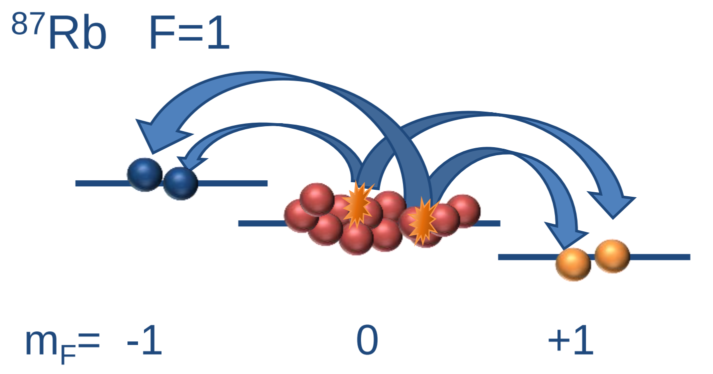


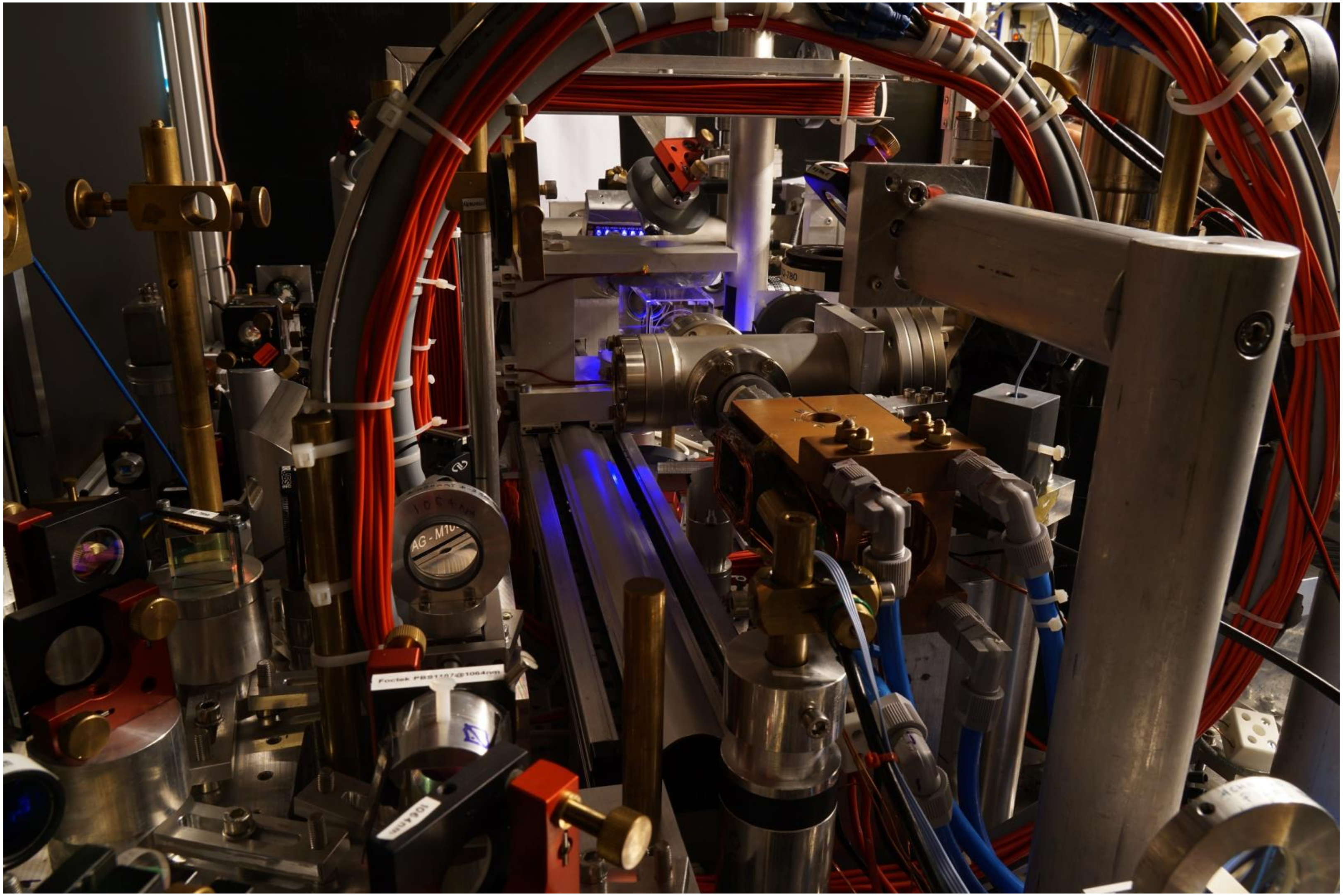
Bild der Quantenmechanik



Erzeugung verschränkter Atome



Spinor Bose-Einstein Kondensat



PRL **117,** 143004 (2016) PHYSICAL REVIEW LETTERS week ending 30 SEPTEMBER 2016

Improvement of an Atomic Clock using Squeezed Vacuum

I. Kruse,[1] K. Lange,[1] J. Peise,[1] B. Lücke,[1] L. Pezzè,[2] J. Arlt,[3] W. Ertmer,[1] C. Lisdat,[4] L. Santos,[5] A. Smerzi,[2] and C. Klempt[1]
[1]*Institut für Quantenoptik, Leibniz Universität Hannover, Welfengarten 1, D-30167 Hannover, Germany*
[2]*QSTAR, INO-CNR and LENS, Largo Enrico Fermi 2, I-50125 Firenze, Italy*
[3]*Institut for Fysik og*
[4]*Physikalisch-Te*
[5]*Institut für Theoretische*

nature COMMUNICATIONS

ARTICLE

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Satisfying the Einstein-Po with massive particles

J. Peise[1], I. Kruse[1], K. Lange[1], B. Lücke[1], L. Pezzè[2,3,4], J. Ar & C. Klempt[1]

In 1935, Einstein, Podolsky and Rosen (EPR) questioned the completeness of quantum mechanics by devising a quantum state of two massive particles with maximally correlated space and momentum coordinates. The EPR criterion qualifies such continuous-variable

QUANTUM ENTANGLEMENT Lange *et al.*, *Science* **360**, 416–418 (2018)

Entanglement between two spatially separated atomic modes

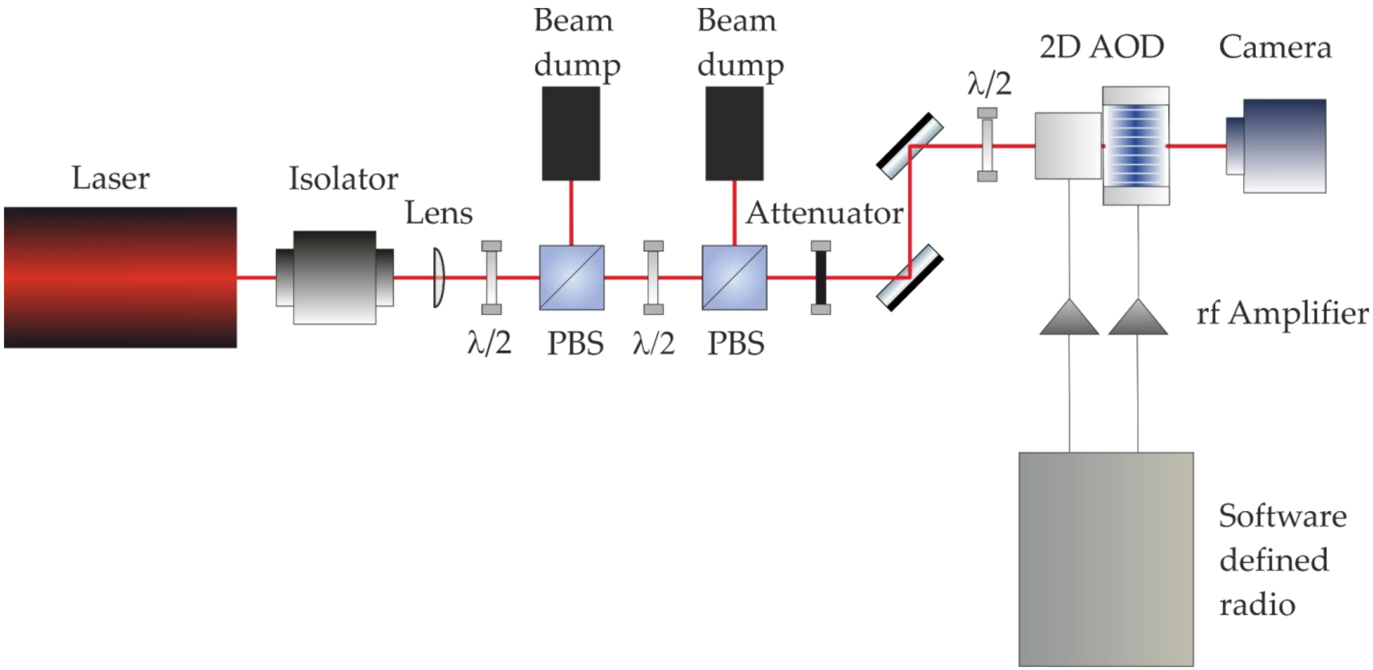
Karsten Lange,[1] Jan Peise,[1] Bernd Lücke,[1] Ilka Kruse,[1] Giuseppe Vitagliano,[2,3] Iagoba Apellaniz,[3] Matthias Kleinmann,[3,4] Géza Tóth,[3,5,6] Carsten Klempt[1]*

Modern quantum technologies in the fields of quantum computing, quantum simulation, and quantum metrology require the creation and control of large ensembles of entangled particles. In ultracold ensembles of neutral atoms, nonclassical states have been generated with mutual entanglement among thousands of particles. The entanglement generation relies on the fundamental particle-exchange symmetry in ensembles of identical particles, which lacks the standard notion of entanglement between clearly definable subsystems. Here, we present the generation of entanglement between two spatially separated clouds by splitting an ensemble of ultracold identical particles prepared in a twin Fock state. Because the clouds can be addressed individually, our experiments open a path to exploit the available entangled states of indistinguishable particles for quantum information applications.

quest

Masterarbeit Mareike Hetzel

Painted Optical Potentials



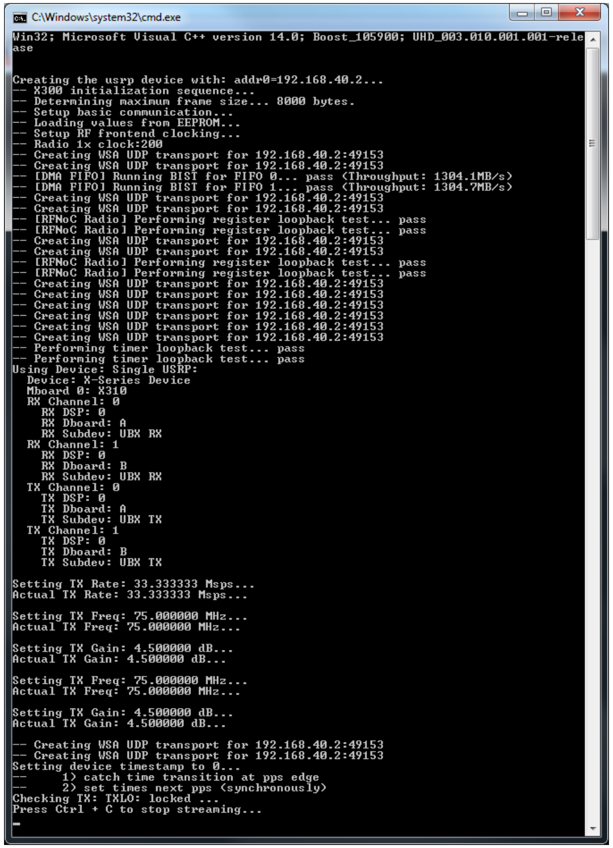
C++ Programmierung

```cpp
for (int count = 0; count < spb; count++) {
    double n = static_cast<double>(count);

    buffer[0][n] = 0.6 * exp(5 * prefactor * n) * exp(phase_correction);
    buffer[1][n] = 0.3 *exp(-3 * prefactor * n) + 0.3 * exp(5 * prefactor * n);
}
```

```cpp
while (true) {
    if (stop_signal_called) break;

    tx_stream->send(
        buff_ptrs, spb, md
    );
}
```

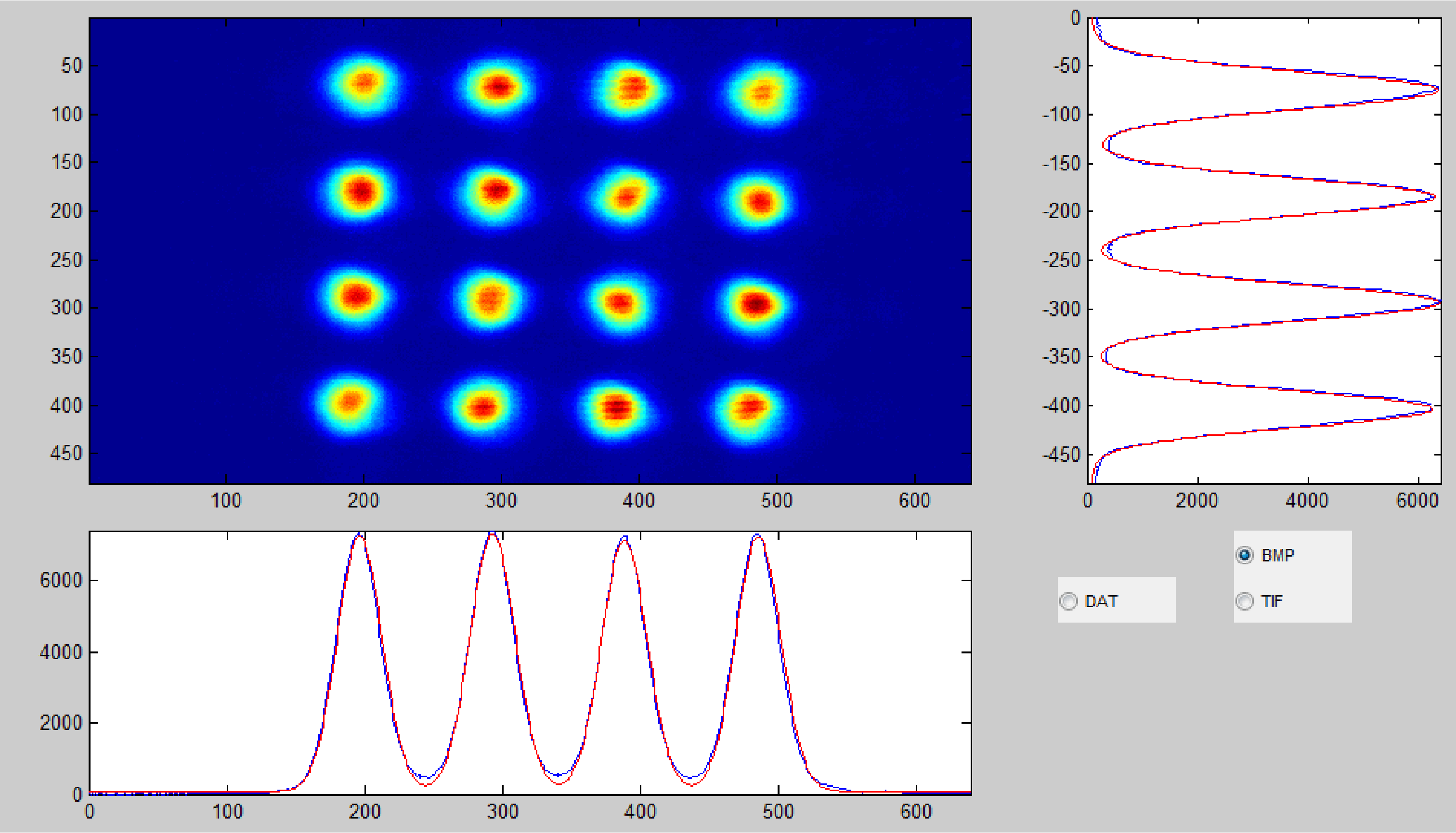


Ettus Research
USRP X310

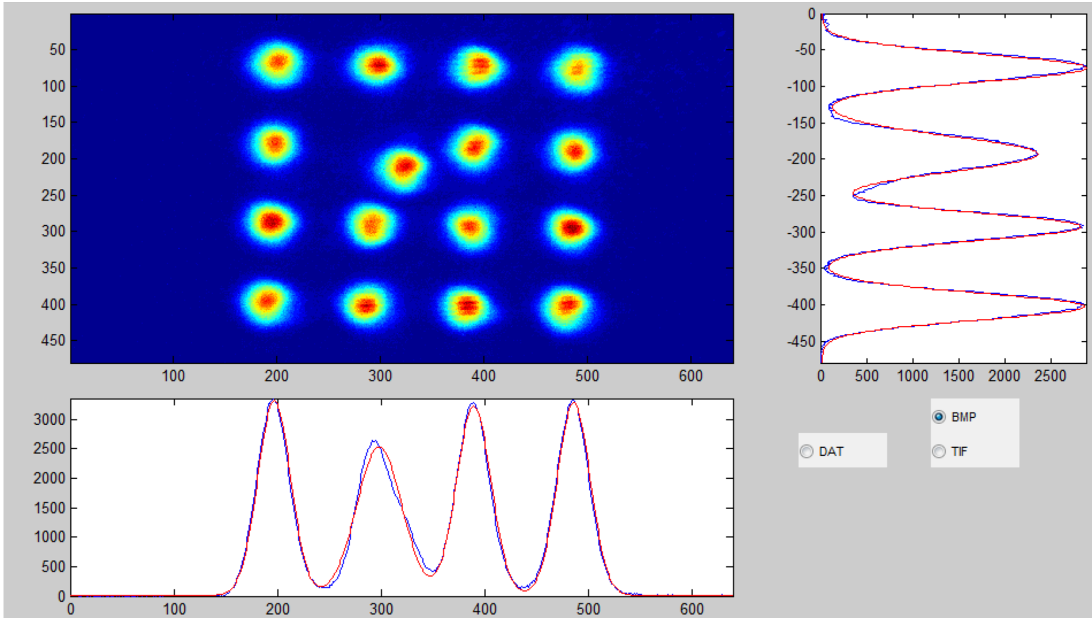
https://www.ettus.com/product/details/X310-KIT

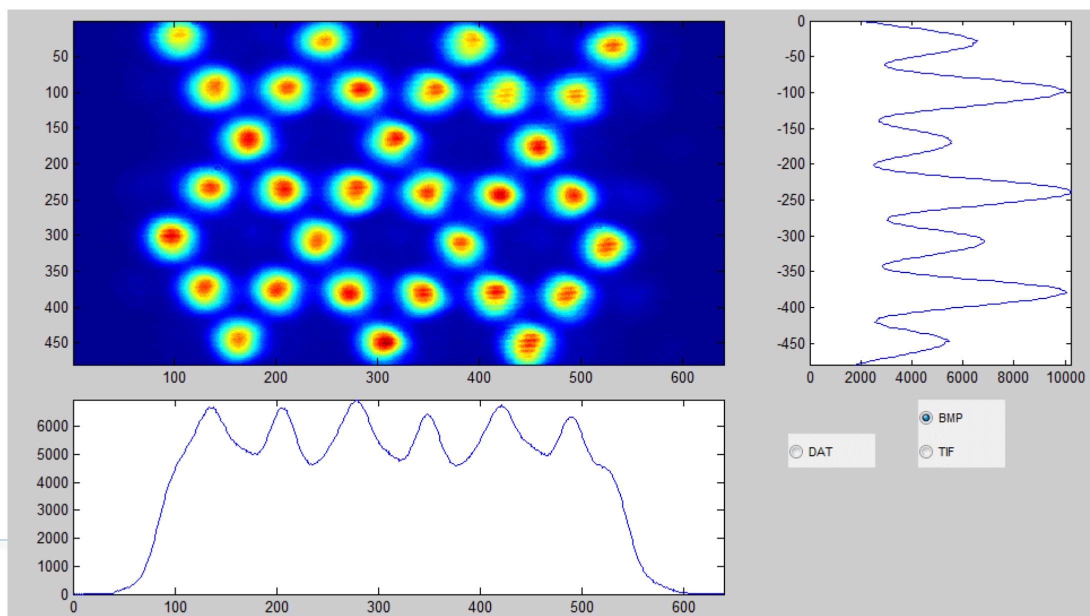
Regular lattice

Deflected beams in the test setup imaged on the CCD camera

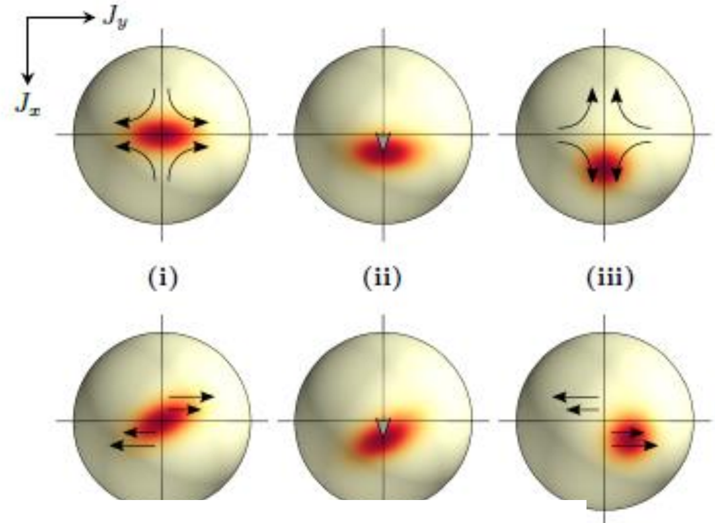


Similar lattices





Masterarbeit Fabian Anders



PHYSICAL REVIEW A **97**, 043813 (2018)

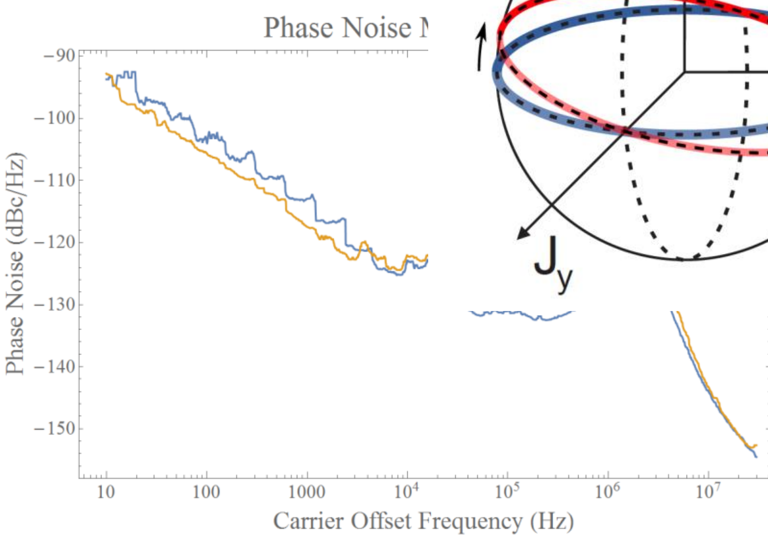
Phase magnification by two-axis countertwisting for detection-noise robust interferometry

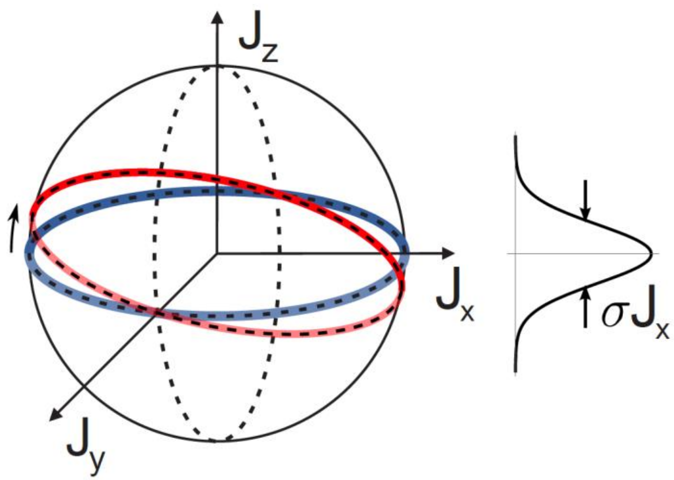
Fabian Anders,[1] Luca Pezzè,[2] Augusto Smerzi,[2] and Carsten Klempt[1]
[1]*Institut für Quantenoptik, Leibniz Universität Hannover, Welfengarten 1, D-30167 Hannover, Germany*
[2]*QSTAR, INO-CNR and LENS, Largo Enrico Fermi 2, I-50125, Firenze, Italy*

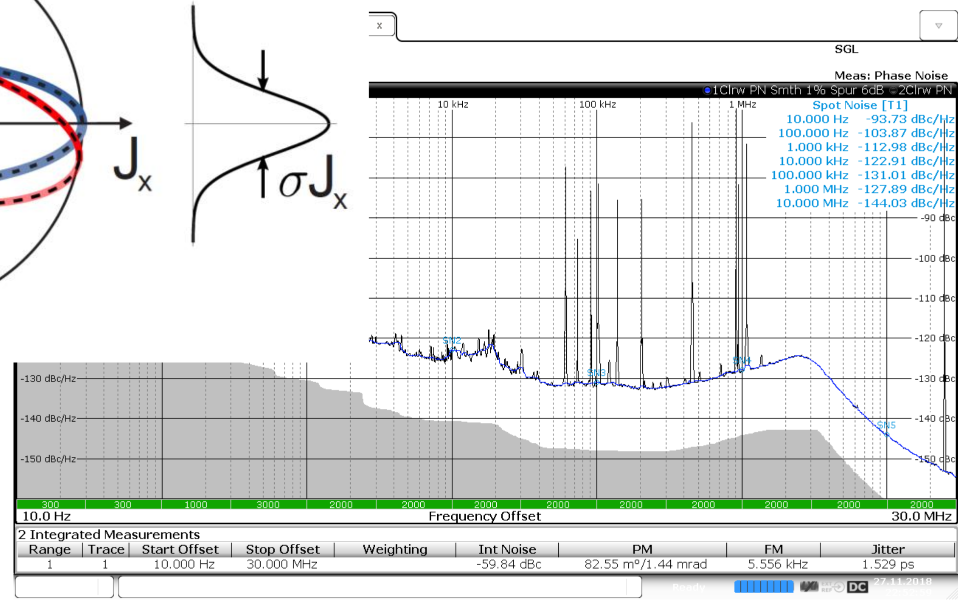
(Received 8 November 2017; published 9 April 2018)

Entanglement-enhanced atom interferometry has the potential of surpassing the standard quantum limit and eventually reaching the ultimate Heisenberg bound. The experimental progress is, however, hindered by various technical noise sources, including the noise in the detection of the output quantum state. The influence of detection noise can be largely overcome by exploiting echo schemes, where the entanglement-generating interaction is

Masterarbeit Bernd Meyer







Date: 27.NOV.2018 22:52:59

Bachelor-, Masterarbeiten

Quantenphysik und Verschränkung
Ultrakalte Atome
Laser
Elektronik
Vakuumtechnik
Hochfrequenzelektronik
Simulation
&
ein nettes Team