

# ikerbasque NEWS

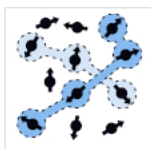
Researchers Zientzia Foroa Ikerbasque BERC Basque Science System

## Quantifying entanglement in a cold gas experiment

Posted on 25 April 2014. Tags: [Entanglement](#) [Geza Toth](#) [Quantum physics](#)

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The results of a collaboration of European scientists—including Ikerbasque researcher Géza Tóth—for creating large entangled quantum states in cold gases has recently been published in Physical Review Letters as an Editor's Suggestion and got also described in physics.aps.org, a web site describing the synopses of selected articles.



Entanglement is a surprising quantum phenomena that turns out to be useful for metrology, for quantum communication, and for quantum computation. Recently there have been a lot of efforts to create entangled states with cold atoms, cold trapped ions and photons.

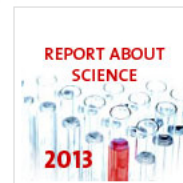
The publication describes an experiment in which a Bose-Einstein condensate of around 8000 cold atoms has been created in the experimental group of Carsten Klempt in Hannover. The quantum state was a Dicke state well known in quantum optics theory, however, not yet realized experimentally before.

On the theory side, the collaboration involved the Ph.D. student Giuseppe Vitagliano and Geza Toth from the Department of Theoretical Physics at UPV/EHU, who worked out a new method to quantify entanglement in this system. Thus, they could show that at least 28-particles have been entangled with each other. Looking for stronger and stronger entanglement is crucial for quantum computation and many other applications of quantum states.

Reference: *Detecting Multiparticle Entanglement of Dicke States*, *Phys. Rev. Lett.* 112, 155304, Bernd Lücke, Jan Peise, Giuseppe Vitagliano, Jan Art, Luis Santos, Géza Tóth, and Carsten Klempt (OPEN ACCESS)

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