



**UvA-DARE (Digital Academic Repository)**

**A general method to determine replica symmetry breaking transitions**

Marinari, E.; Naitza, C.; Parisi, G.; Picco, M.; Ritort, F.

*Published in:*  
Physical Review Letters

*DOI:*  
[10.1103/PhysRevLett.81.1698](https://doi.org/10.1103/PhysRevLett.81.1698)

[Link to publication](#)

*Citation for published version (APA):*

Marinari, E., Naitza, C., Parisi, G., Picco, M., & Ritort, F. (1998). A general method to determine replica symmetry breaking transitions. *Physical Review Letters*, 81, 1698. DOI: 10.1103/PhysRevLett.81.1698

**General rights**

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

**Disclaimer/Complaints regulations**

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <http://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

**Comment on “A New Type of Evaporative Cooling for Neutral Atoms”**

We believe the Letter by Stoop [1] contains a serious conceptual error and that the conclusion that Bose-Einstein condensation (BEC) can be approached using the proposed method is wrong.

The Letter proposes a method to cool a trapped gas of metastable atoms in such a way that the energy distribution remains thermal even in the absence of thermalizing collisions. This is achieved by arranging a loss mechanism that is proportional in strength to the potential energy of the particles, which will cause particles to be removed from all trapped states, but preferentially from the highest energy states.

In the Letter [1], an explicit analysis is given of the cooling dynamics in the one-dimensional case. However, the conclusion that BEC is attained is based on incorrect use of Eq. (18), which is valid only for a harmonic trap in three dimensions. Actually, as is clearly seen from Eq. (14), the proposed cooling method does not increase the occupation of any trap state. This is not a coincidental feature of the specific system chosen by the author. For a more general class of cooling mechanisms, Ketterle and

Pritchard have shown [2] that *in the absence of collisions* no loss process or time dependent term in the Hamiltonian can lead to increase in the occupation number of any trapped state.

When we extend the analysis of the author to 3D, a step that was not performed in the Letter, we find that the value of  $\Omega \mathcal{N}^{1/3}/k_B T$  becomes independent of time. Hence, the proposed type of cooling does not lead to BEC.

In conclusion, we would like to emphasize that collisionless loss processes, such as were considered in the Letter, cannot bring a trapped gas closer to quantum degeneracy.

A. P. Mosk, M. W. Reynolds, and T. W. Hijmans  
Van der Waals-Zeeman Instituut  
Universiteit van Amsterdam  
Valckenierstraat 65, 1018 XE Amsterdam, The Netherlands

Received 16 April 1998 [S0031-9007(98)07316-5]  
PACS numbers: 32.80.Pj, 03.75.Fi, 67.65.+z

- [1] H. Stoop, Phys. Rev. Lett. **80**, 3026 (1998).  
[2] W. Ketterle and D. E. Pritchard, Phys. Rev. A **46**, 4051 (1992).