



**Conference on Long-Range Interacting Many-Body Systems:  
from Atomic to Astrophysical Scales  
(25 - 29 July 2016)**

**Venue: ICTP Leonardo da Vinci Building - Budinich Lecture Hall**  
(tel: +39 040 2240346, fax: +39 040 224163, e-mail: [smr2830@ictp.it](mailto:smr2830@ictp.it))

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Title:

**Cooperative effects in light scattering by cold atoms**

Speaker:

**Romain BACHELARD**

Affiliation:

Universidade de Sao Paulo  
Instituto de Ciencias Matematicas e de Computacao  
Brazil

The scattering of light by cold atomic clouds, and many other light scattering problems, is a long-range problem by nature. Indeed, the light creates an effective interaction between the particles, which presents the slow decay of waves over large distances. This allows to reach a strong 'long-range' coupling between the particles, a paradigmatic example being the mean-field coupling of atoms in 1D optical cavities. 3D systems also exhibit strong inter-particle coupling, with a  $1/r$  decay over long distances.

As a result from this strong coupling, a variety of 'cooperative' effects were observed in light scattering by atomic clouds, that are the signatures of the presence of macroscopic modes. In this presentation, we will discuss such cooperative phenomena in large atomic clouds, which include superradiance and subradiance, Mie scattering and cooperative radiation spectrum.