Call 2019

PACE-IN

Photon-Atom Cooperative Effects at Interfaces

- *CNRS, Nice, France*
- *Forth, Heraklion, Greece*
- *Weizmann Institute, Rehovot, Israel*
- *INFN, Bari, Italy*
- *Palacký University , Olomouc, Czech Republic*

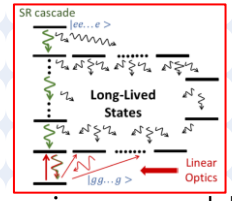
PROJECT PROGRESS (highlights)

CHALLENGE

Coherent, well-controlled quantum interfaces between matter and light assisted by cooperative effects (collective enhancement/suppression of coupling, super/subradiant emission-absorption/storage) offers many advantages for quantum information processing and communications, but are difficult to engineer and control.

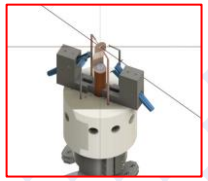
SOLUTION

Study atomic/ionic ensembles with strong, long-range interactions and their collective coupling and decoupling from quantum light fields, to attain high-precision control of interactions and interfaces



IMPLEMENTATION

- Experimental observation of enhanced population of subradiant states by strong driving
- Quantification of super- and subradiant emission from dense, dipole-dipole interacting atomic ensembles, controlled Raman conversion between stored or propagating photons & optimal collection
- Complexity approach : open quantum systems, qubits coupled to a thermal bath
- 2 new ions traps build with coherent light emission detected



HURDLES

- Control of large number of collective modes : complexity approach
- COVID : delays in experiments and in in person meetings for novel protocol design

IMPACT (RRI aspects)

GENDER:

- 6 female researchers involved (1 staff, 4 postdocs, 2 PhDs)
- Headhunting for female candidates for permanent positions

OPEN SCIENCE: all papers are available in open access

SCIENCE EDUCATION:

- training by research (PhDs, postdocs)
- lectures on quantum technologies in workshop and summer schools

PUBLIC ENGAGEMENT:

- 1 dissemination book on cold atoms and quantum technologies
- 1 startup in preparation

ETHICS:

- students encouraged to participate in workshops and meetings
- PhD student involved in startup project

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