

Scientific report on the visit to  
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**Visit to LENS (Florence, Italy) and BEC center (Trento)**

The visit to Dr. Matteo Zaccanti at the European Laboratory for Nonlinear Spectroscopy (LENS) has been very fruitful. The aim of the visit was discussing the final stages of the writing of our review, temptatively titled "Polarons, Molecules, and Itinerant Ferromagnetism in ultracold Fermi gases". During the three days of my stay at LENS we have been revising the general structure of the manuscript, and filling missing gaps. The discussion over the review was continued in the following week in Trento, where I met the third author of the review, Prof. Georg Bruun. The review is presently in a very advanced stage of completion, and we plan to submit it by the end of July.

At LENS I also gave a seminar presenting my latest results on ultracold fermionic gases, and discussed intensely with Drs. Fallani, Sias, and Catani, who are carrying out experiments on multi-component Ytterbium gases. We are working on a common theoretical-experimental project on novel cooling strategies. The experimental apparatus is presently being adapted to address the physics we have been proposing, and we expect to be able to test the theoretical proposal soon.

Besides working on the review, in Trento I have been attending the first week of the POLATOM Summer Programme on "Synthetic Gauge Fields for Photons and Atoms", and the Conference in honor of Lev Pitaevskii's 80th birthday. During the Summer Programme I had the chance to interact with many leading scientists working on the timely topic of synthetic gauge fields. In particular, I had intense discussions with Prof. Juzeliunas and Dr. Goldman, with whom I am writing a paper, due for submission within the next month. Discussions on photonic systems with Drs. Rechtsman and Plonik have also been very stimulating, and may eventually lead to a future common project.

### **Prospected scientific output and future extensions**

The present work will lead within the next month to the submission of a 40 page long review on imbalanced fermi gases, and of a research paper on novel schemes for realizing synthetic gauge fields. A joint theoretical-experimental publication with the group at LENS is envisaged. The project is presently in a preliminary stage, but the experimental setup is presently being assembled, and a common publication could be reasonably foreseen within the next year.