

# Summary Prof. Johan Juul Chang visit:

## *Short-term mobility call 2016 at CNR-SPIN Salerno*

In the weeks 17-28.10.2016, Prof. Johan Chang stayed at the CNR SPIN Institute in Salerno c/o the physics department of the University of Salerno. This was made possible by a CNR short-term mobility grant. Overall, this was two very exciting weeks and many fruitful discussions emerged during this stay. Below is a short summary of the activities and project discussions.

### **SEMINAR:**

In the first week, Prof. Johan Chang gave a department seminar about recent synchrotron results obtained on ruthenate (arXiv:1610.02854) and cuprate materials (Nat. Comm. **7**, 11494 (2016)). Both topics overlapped well with main research themes of the CNR-SPIN Salerno. The atmosphere was therefore interactive both during the presentation and for the following discussions.

### **DISCUSSIONS:**

Following the seminar several more detailed discussions were arranged. For example, based on a Salerno project, we discussed the physics of electron doped cuprates with Dr. Anita Guarino and Prof. Angela Nigro. In another case, discussed with Prof. Roberta Citro the recent experimental development of hole doped cuprates and how her diagrammatic approaches to the single band Hubbard model can generate understanding for this problem. In the second week, we (Dr. Alberto Ubaldini, Dr. Veronica Granata, Luisa Rocco, Dr. Rosalba Fittipaldi & Dr. Antonio Vecchione) also discussed interesting new electronic materials that can be studied with light and spectroscopy / diffraction techniques. Along the same lines, we had a brainstorming session with theoretical input from Dr. Wojciech Brzezicki & Dr. Mario Cuoco, the main output of this discussion has been to foresee the prospects of future materials with magnetically induced topological aspects.

### **EMERGING PROJECTS:**

This research exchange stay was originally established to amplify an already successful collaboration between Prof. Johan Chang (at University of Zurich, Switzerland) and Dr. Rosalba Fittipaldi & Dr. Antonio Vecchione (CNR SPIN Salerno). Experiments on ruthenates (ruthenium-oxide) materials had therefore already been carried out using synchrotron and neutron large scale facilities. In particular, this had made available a comprehensive resonant inelastic x-ray scattering study on  $\text{Ca}_2\text{RuO}_4$  for which only a subset of data had been published (by this collaboration) previously. Together with the theory experts Dr. Mario Cuoco and Dr. Fiona Forte we brainstormed possible interpretations that would lead to a global understand of the data and hence the orbital configuration of this exotic Mott insulator. In this fashion, we brought together material experts (Dr Vecchione, Fittipaldi and Cuoco with decade long experience on ruthenates materials) and spectroscopists (Prof Chang and Dr Forte) with both experimental and theoretical background. This approach was very successful and through three sessions we produced a coherent interpretation of the data. In the coming months, we will therefore pursue this to accomplish the work by a publication that will be submitted to a high-profile scientific journal.

### **CONCLUSIONS:**

In summary, it has been two very exciting weeks that generated concrete projects to be accomplished. This short-term stay also established new collaborations. Over all it has therefore been highly successful. I would therefore grateful to the CNR-spin who supported this mobility-stay.