Varying Fundamental Constants and Dynamical Dark Energy

Sesto, Val Pusteria (BZ) , 8-13th July 2013

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Luca Amendola (Heidelberg University),
Bruce Bassett (Cape Town University),
Enrique Garcia-Berro (UPC, Barcelona),
Susana Landau (Buenos Aires University),
Sergey Levshakov (Ioffe Institute, Saint Petersburg),
Joao Magueijo (Imperial College, London),
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Wim Ubachs (University of Amsterdam),
Jean-Philippe Uzan (IAP, Paris),
Elisabeth Vangioni (IAP, Paris),
John Webb (New South Wales University, Sydney)

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Gabriella Schiulaz (INAF-OATs)
Sergio Monai (INAF-OATs)
Paolo Molaro (INAF-OATs chair)
Luca Caridá (Sexten Center for Astrophysics)

Sponsorship

National Institute of Astrophysics (INAF)
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FOREWORD

The concept that fundamental physical constants may change over time dates back to Dirac's Large Number Hypothesis in the late 1930's and had been a very fertile idea in theoretical physics and cosmology throughout the XX century. Two fundamental constants, the fine-structure constant and the proton-to-electron mass ratio, can be effectively probed by means of the study of intervening absorption systems in the spectra of the more distant quasars, Cosmic Microwave Background and Primordial Nucleosynthesis. At present times the detection of their variation throughout space-time is seen as a possible manifestation of the presence of light scalar fields pervading the Universe, the presence of which is foreseen in many cosmological models trying to account for the dark energy.

All this was discussed at the Workshop *Varying Fundamental Constants and Dynamical Dark Energy* held in Sesto, Val Pusteria (BZ) , on 8-13th July 2013 in the building of the Primary School of Sesto, under the beautiful landscape of the Dolomites.

The workshop was the last of a series of meeting dedicated to this subject which started with the 1983 meeting at the Royal Society organized by W. H. McCrea, M. Rees, and S. Weinberg on *The constants of physics*. Successively a JENAM meeting took place in Porto in 2002, which was followed by the conferences on *Astrophysics, Clocks and Fundamental Constants* organized in Bad Honnef in 2003 and 2007. More recently in 2009 a Joint Discussion *Are the Fundamental Constants Varying in Space-time?'* was held at the IAU conference in Rio 2009 and in 2010 the JENAM Symposium 2010 *From Varying Couplings to Fundamental Physics'* was held in Lisbon. A series of conferences which testifies the growing interest in the field.

We take the opportunity to thank all the participants for their presentations of unique quality and for sharing their most recent results which made the Workshop particularly successful as it is reflected in these proceedings.

We are grateful to the Scientific Organizing Committee for their valuable advice in making the scientific program. The SOC was composed by Luca Amendola, Bruce Bassett, Enrique Garcia-Berro, Susana Landau, Sergey Levshakov, Joao Magueijo, Michael Murphy, Keith Olive, Patrick Petitjean, Dieter Reimers, Rodger Thompson, Wim Ubachs, Jean-Philippe Uzan, Elisabeth Vangioni, John Webb.

A special thank to Gabriella Deconi, better known among the participants as Gabry-one, and Gabriella Schiulaz, the Gabry-two, of the local organizing committee for making the meeting not only scientifically successful but also very enjoyable. We are pleased to acknowledge financial support from the National Institute of Astrophysics (INAF) and from the Consortium for Physics of Trieste. The Sexten Center for Astrophysics and the Sexten Touristic Association are also acknowledged for the warm hospitality.

The Organizing Committee:
Carlos Martins & Paolo Molaro

cover caption: for the cover of this volume we used a slide from Martin Wendt's talk who took the reverse of the "Tre Cime di Lavaredo" peaks to mimic QSO's absorption lines.

Fig. 1. The conference group

Fig. 2. Enjoying the conference dinner

Fig. 3. Enjoying the conference dinner

Fig. 4. During the lectures

Fig. 5. Michael Kozlov and Victor Flanbaum

Fig. 6. Martin Wendt, Hadi Rahmani, Anand Srianand, Sergei Levshakov and Sandro D'Odorico

Fig. 7. Sandro D'Odorico, Paolo Molaro, Micha and Sergei Levshakov, Martin Wendt

Fig. 8. Ewan Cameron and Nissim Kranekar

Fig. 9. Sergei Levshakov