REPORT OF ACTIVITIES DURING MY VISIT TO CERN-TH AS PART OF THE HELEN PROGRAMME - RESEARCH TRAINING

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During my visit to the theory division at CERN, from the 12th of June to the 27th of July, the following activities were done:

- The WMAP year-three papers [1, 2, 3] were carefully read. Interesting information about the CMB temperature and polarisation analysis as well as their implications on cosmology were extracted. A talk for non-specialised public about these subjects, to be given in August at the Universidad Industrial de Santander in Colombia, was prepared.
- The PLANCK scientific programme [4] was analysed, looking for future avenues of research offered by the expected improvement in the forthcoming satellite data.
- A review on the different scenarios for the origin of the large-scale structure was initiated. The paper is expected to be submmited within the second semester of 2006. The aim of the paper is to focus on
  - The various scenarios of structure formation [5]: single field inflation, multi-field inflation, curvaton, modulated fluctuation, the recent model-building progress and observational constraint.
  - Non-gaussianity issues [6, 7]: the f_{NL} parameterisation, the level of non-gaussianity in single field inflation, in multi-field inflation, and in the curvaton scenario.
  - The curvaton model [7, 8, 9, 10, 11]: status of the model, high-energy physics model-building, curvaton web.
- Work on cosmological non-gaussianity was carried out. The latest papers about primordial non-gaussianity were carefully read [12, 13, 14, 15]. A paper about higher order field perturbation correlators contributing to the primordial non-gaussianity [16, 17, 18, 19] is currently being prepared. It is expected to be submmited within the second semester of 2006.
- Based on the papers in Refs. [20, 21, 22] where a thermal state prior to inflation is considered, I have developed a scenario where the usual lower bounds on the scale of inflation in the simplest curvaton model [23] are greatly relaxed. Such a scenario supports then, in a more natural way, the possibility of identifying the inflaton with one of the scalar fields of the forthcoming observable sectors in models of new physics, without modifying the dynamics of the simplest curvaton model. Informal exchange of ideas with Kaushik Bhattacharya, coauthor of Refs. [20, 21], from the Physical Research Laboratory at Navrangpura, Ahmedabad in India was established. The paper will be worked out and sharpened within the second semester of 2006. Submission is expected at the end of 2006 or beginning of 2007.

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