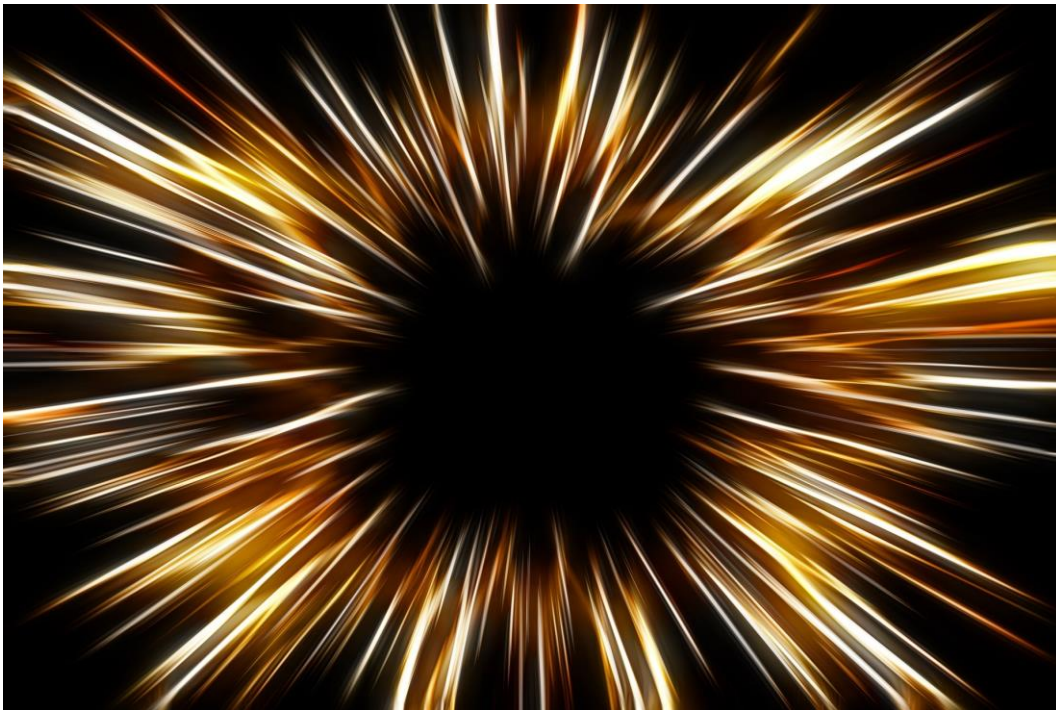


PRESS RELEASE

News from the Big Bang: Planck satellite builds the foundations of new Cosmology

For the first time, the analysis of data collected from the satellite unveils the structure of the polarized signal of Cosmic Microwave Background Radiation "reflected" by the first astrophysical objects. The signal could contain the imprint of gravitational waves produced immediately after the Big Bang. SISSA scientists have had an important role in the research



Trieste, 19 July 2018

«This evidence opens up a new phase in the study of the primordial Universe». This is how Carlo Baccigalupi and Luigi Danese of the Astrophysics and Cosmology group of SISSA - Scuola Internazionale Superiore di Studi Avanzati comment the results published on 17 July relating to the final analyses on the data from the Planck satellite, to which the scientists of the School made a fundamental contribution. The polarized signal of the Cosmic Microwave Background Radiation in the whole sky was revealed for the first time, opening

up a new chapter in understanding the Universe thanks to this fundamental tracer. This signal is produced by the ancient light “bouncing” on the charged particles freed from the first structures in formation: it could contain the imprint of gravitational waves produced fractions of a second after the Big Bang. This discovery would be a new revolutionary observation channel of that huge initial explosion and of the still unknown physics processes of the highest energies occurred fractions of a second after the explosion. The researchers from Trieste say that the results of Planck «shake the very foundation of basic principle knowledge in Astrophysics, Cosmology and Physics of the Particles and show that this research is now possible. It has already permitted the drawing, construction and gathering of data of scores of observatories on Earth, in the Stratosphere and in Space, in charge of investigating new scenarios explored by Planck».

The Planck satellite and Trieste’s research

The Planck satellite was built by the European Space Agency and launched in 2009 towards a precise observatory 1 million kilometres from Earth. Italy has contributed substantially to the project through the conception, construction and analysis of data of one of the two tools on board, thanks to the support of the Space Agency and of the efforts of individual institutions. The experiment marks a milestone in the history of observational Cosmology.

The SISSA researchers involved in the research related to the Planck experiment and the cosmic microwave background radiation is currently composed of PhD students Paolo Campeti, Farida Farsian, Anirban Roy and by researchers Nicoletta Krachmalnicoff, Francesca Perrotta and Davide Poletti, in addition to professors Baccigalupi and Danese,

In the Planck mission the SISSA team covered roles of responsibility, guiding entire workgroups and participating in the data analysis together with researchers of the National Institute of Astrophysics at the Astronomical Observatory of Trieste. The SISSA team is currently at the forefront in missions that extend its research: specifically, the scientists of the School are engaged in researching the Gravitational Waves in the background radiation thanks to highly advanced tools such as the Large Scale Polarization Explorer and the Q and U Joint Experiment in Tenerife, the Simons Array and the Simons Observatory on the high plain of Atacama, and the future LiteBIRD satellite, which could see three space agencies, Japanese, American and European, at work together.

A great achievement for SISSA

«For SISSA this is the crowning achievement of decades of efforts, investments, research and training of young researchers who now work in the USA, China, India and Europe» explains Baccigalupi. «It is a huge scientific and strategic success for the school, made possible thanks to the vision of the scientists who have perceived the scope of these ventures and the potential of the Trieste Institute in recent decades. It also marks an arrival and departure point that projects SISSA into the extraordinary challenges of the next decade, which will see a further progression of knowledge thanks to the synergy between different areas of research: astrophysical and cosmological observations, development of

new methods in the science of data gathered from experiments and, finally, basic physical theories».

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