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SEMINAR

Hearing the first breath of the Universe. The quest for primordial gravitational waves by looking at the black background of the sky

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Abstract: Gravitational waves are a physical reality. The wonderful measurements performed by the LIGO interferometers in the last year and a half have put on paper these tiny space-time wrinkles and opened a new era in Astrophysics and Cosmology. This discovery makes the challenge of finding primordial gravitational waves even more fascinating.

What are these waves? According to theories of inflation, that attempt to describe the very first $10^{**}(-35)$ seconds of the evolution of our Universe, they resulted from tiny quantum fluctuations that were stretched to macroscopic scales during a very fast expansion phase, occurred when the universe was less than $10^{**}(-35)$ seconds old. According to inflation these quantum fluctuations are the seeds from which radiation and matter were formed, lately condensing in stars, galaxies, planets and, ultimately, ourselves.

Detecting the imprint of these waves is challenging and many scientists all over the world are trying hard to arrive first. It implies to detect a very faint polarized signal in the cosmic microwave background, the primordial microwave radiation that isotropically permeates the Universe and that we can detect by observing the black background of the sky.

In this talk I will review the efforts and current results in this difficult and fascinating quest, giving particular emphasis to the challenges in microwave technologies and the efforts to build a new generation of instruments, which are necessary to reach the required sensitivity and stability.

Bio: Aniello Mennella graduated in Physics in 1989, and since 2015 he is Associate Professor at the Department of Physics of the University of Milan. Since 1999, the main research interests are in experimental cosmology, focusing in particular on the development of instruments for the measurement of the Cosmic Microwave Background, the first light in the universe. He worked on the ESA Planck mission and in several other projects for the observation of the universe from the Earth and from the stratosphere.

Prof. Mennella hold the course "Introduction to Astrophysics" for the BSc degree in Physics, "Laboratory of Space Instrumentation" for the Msc degree in Physics and "Science Communication" for PhD students in Physics, Astrophysics and Applied Physics. Prof. Mennella is also active in science popularization since 2002 for schools and general public. He is particularly interested in joining science popularization with other communication means like theatre, music, video.

From 1990 to 1999 he worked at ENI carrying out applied research in the field of oil and gas production and exploration, exploring a wide range of area in physics: plasma physics, physics of the atmosphere, fluid dynamics in porous media, colloid science, geophysics and geochemistry.

The activity of Prof. Mennella is documented in almost 200 refereed publications and about 40 conference proceeding papers.

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