Intensity mapping: a new window in cosmology

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Over the last decade, considerable effort has gone into investigating the evolution of the baryonic universe, especially after the epoch of Cosmic Dawn: signalling the birth of the earliest stars and galaxies — widely considered the “final frontier” of observational cosmology today. These studies of the history of baryonic matter — an excellent probe of the formation of cosmic structures and galaxies — now promise important constraints on fundamental physics and cosmology. In particular, the technique of (line) “intensity mapping” has emerged as a powerful tool to explore this phase of the universe by measuring the integrated emission from sources over a broad range of frequencies, and contains significantly more information than traditional galaxy surveys. I will describe an innovative approach towards the mapping of atomic hydrogen (HI) over 12 billion years of cosmic time, which allows us to fully utilize our current knowledge of HI astrophysics to forecast cosmological constraints from intensity mapping observations. This opens up the exciting possibility of constraining fundamental physics from observations of the Cosmic Dawn.

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