IAUS333: Peering towards Cosmic Dawn

Oct 2-6, 2017, Dubrovnik, Croatia

SUMMARY OF THE SCIENTIFIC HIGHLIGHTS

The results from the current Epoch of Reionization (EoR) experiments (using e.g. LOFAR, MWA and PAPER) are currently under way. These very deep observations will not only set constraints on when and where the first sources formed in the early Universe and began (re)ionizing the predominantly neutral all-pervasive intergalactic medium, but they are also providing high-quality data for cutting edge auxiliary foreground science.

Obviously studying the physical origin of the foregrounds, whether Galactic or extragalactic, is a very exciting field in its own right and is of fundamental importance for perfecting the foreground removal techniques in the cosmological experiments.

This symposium discussed both through: (i) giving the clearest and widest possible view on the EoR; (ii) showing the richness of data and presenting the state-of-the-art foreground science; and (iii) discussing challenges of upcoming and planned radio facilities (e.g. HERA and SKA).

Based on presented results of the major low-frequency radio telescopes there is substantial overall progress towards the detection of the cosmological 21cm signal. However, the effort required is much more demanding than it previously thought. Issues related to precision calibration of the instruments and subtle systematic biases are mainly hindering detection at present. Different teams are now working on resolving some of these issues. In the coming months, the LOFAR-EoR team expects to set soon the best upper limits on the EoR signal, ruling out some unusual reionization history scenarios.

Recent low frequency observations also revealed a bewildering variety of Galactic structures in polarization. Some of them are very long and straight filaments that resemble the observed HI fibers and correlate well with the magnetic field probed by the Planck mission. Their origin is still not known. This clearly calls for a multi-frequency study which, probes different physical quantities of the interstellar medium and its complicated structure.

Deep EoR observations started to reveal the true underlying distribution of very faint extragalactic sources. Theoretical source counts predict a significant contribution of star-forming galaxies at sub-mJy flux densities, but there is also the possibility of an unknown distribution of radio sources that might dominate at these flux densities. Combining these deep low-frequency radio data with observations at other frequencies will allow a detailed study of the formation and evolution of galaxies as a function of cosmic time and their environment.

IAUS333 remained well attended up to and including the last sessions on Friday with lively discussion during the sessions and the coffee and lunch breaks. Immediate feedback from many participants indicated that overall IAUS333 was experienced as a successful and timely meeting, generating many new ideas and forging new collaborations.