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Update on the REACH experiment

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The Radio Experiment for the Analysis of Cosmic Hydrogen (REACH [1]) is a 21-cm sky-averaged (global) experiment attempting the detection and study of the elusive 21-cm line from primordial Hydrogen. The 21-cm line (redshifted to a few hundred MHz due to the expansion of the Universe), is meant to be the prime tool for studies of the early phases of the Universe (Dark Ages, Cosmic Dawn and the subsequent Epoch of Re-ionization). REACH covers a redshift of ~7-28, which should allow it to study the Cosmic Dawn and Epoch of Re-ionization. The main observational challenge for this type of experiments is the calibration of the foregrounds and the instrument itself, contributing contaminating signals and distortions ~5 orders of magnitude larger than the cosmological signal of interest in the case of the foregrounds (mostly synchrotron radiation from our own galaxy and ionospheric effects). In 2018, the EDGES experiment reported the very first potential detection of the 21-cm signal from the Cosmic Dawn [2]. The origin of this profile is still to be confirmed by another experiment, which should clarify some of the concerns on the EDGES detection regarding the data analysis and the potential effect of instrument systematics.

REACH has been specifically conceived to understand the effect of systematic signals in the data analysis. REACH differs from other 21-cm experiments in the following aspects:

- Ultra-wideband system (>3:1) providing extra information for the data analysis.
- 2 radio meter antennas observing the sky simultaneously and providing extra information for isolating the effect of systematic signals.
- Comprehensive Bayesian data analysis for joint fits of the cosmological signal, foregrounds and instrument systematic signals.
- In-field Bayesian calibration for the receiver electronics.

In this presentation we will discuss the current status of the project and the latest results of our simulated analysis in preparation for real data analysis expected to commence in the summer of 2022.

1. E. de Lera Acedo, *REACH: Radio Experiment for the Analysis of Cosmic Hydrogen*, ICEAA, 2019.
2. J. Bowman, A. Rogers, R. Monsalve, T. Mozdzen, and N. Mahesh, *An absorption profile centred at 78 megahertz in the sky-averaged spectrum*, Nature, 2018.