# Update on the REACH experiment

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In Global 21cm experiments, the spectral and spatial structure of the foregrounds couple with the spectral and spatial variations of the antenna on the ground, resulting (even for a simple dipole antenna) on antenna temperature variations hardly model-able with a simple low order polynomial, and highly dependent on LST and integration times. In order to show more evidence on the EDGES results published in 2018, REACH's unique approach consists on jointly fitting physics-rooted models of the cosmological signal, the sky radio foregrounds and the instrument itself in a Bayesian manner. The aim of this approach is to be able to explain any residual instrument systematics. Furthermore, REACH is a wide band experiment covering both the Cosmic Dawn and the Epoch of Re-ionization (z = 6-20).

REACH uses a nested sampling tool, PolyChord, and parametrized foreground and instrument models and 21-cm models for the signal detection. The pipeline is currently under development. REACH also features a switched calibrator RF receiver using in-field measurements of the analogue and digital components on the receiving chain. The calibration of the receiver is also done using PolyChord. The spectrometer features 6 KHz channels (for RFI excision) and is based on the SKA1-LOW Tile Processing Module FPGA board. REACH is cash funded by the Kavli Institute for Cosmology in Cambridge, with contributions from Stellenbosch University in South Africa and the ALBORADA trust fund and is currently being deployed in the RFI-quiet Karoo radio reserve in South Africa, location of the HERA experiment, MeerKat, and the future SKA1-Mid. REACH will commence commissioning in early 2021 using the phase I system: 2 antennas but no simultaneous observations. The antennas: a conical log-spiral antenna and a hexagonal dipole have been chosen my maximising the log evidence (in a Bayesian sense) of needing a 21-cm signal model to explain the data and minimising the error difference between the detected signal and the recovered signal in a simulated pipeline.