

SKA: Configurations and Simulations

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Current SKA designs call for sensitivities at the nano-Jansky level and imaging over wide fields of view. In depth simulations that produce realistic visibility data sets will be required in order to test imaging algorithms and ensure that dynamic ranges of $\sim 10^6$ can be achieved. Haystack observatory has developed an SKA simulator that produces data sets including effects of a turbulent ionosphere, time variable station beams, realistic skies at SKA sensitivities and antenna noise that is dependent on sky position. Though data for any SKA concept can be produced with the simulator, it is tailored for the Large-N case and includes the capability of combining multiple individual receptors into phased stations with realistic beamforming algorithms. A flexible format for describing frequency channels allows general investigation of multi-frequency synthesis issues.

In addition to producing data sets, the simulator can efficiently be used to search through SKA configuration parameter space for optimal designs. Figures of merit including total cable length to connect stations, point spread function sidelobe levels and point spread function shape allow possible configurations to be ranked and filtered using genetic algorithms.

We present results from our initial parameter searches and show imaging results of SKA skies simulated under realistic data gathering conditions. Algorithms used in the simulator will be discussed.