A Strawman

The strawman described in the Table below is one minimum version of the SKA Reference Design. It was framed for the following purposes:

- to provide a discussion base for the EWG task forces in the lead-up to Paris;
- to give a framework within which initial costing and performance information can be assembled in readiness for the Q4 2006 system engineering study;
- to promote discussions between the science and engineering communities, especially in the context of a “minimum” SKA rather than the expanded models normally presented.

The Reference Design incorporates a low-frequency array for Era of Recombination studies. The strawman does not address the EoR array, assuming implicitly that it would be based on aperture array technology of the type being proven by LOFAR, MWA etc.

One implementation of the SKA Reference Design – A discussion strawman (PJH, 14.7. 06)

Controversial Characteristic	Value	Assumptions/Comments
Antennas	4000 x 12 m dishes; solid surface; 2.5 mm rms Feeds, inner array (<5 km) 0.3-3 GHz PAF in 2 bands 3-10 GHz WBF Feeds, outer array (>5 km) 0.3 – 10 GHz WBF(s) (single pixel)	€100k antenna; leaves way open for higher frequencies if 22 GHz antenna can be supplied within budget. Still builds enough low freq area to be interesting in that case. If f>3 GHz definitely not interesting, could aim for 15m (mesh?) dishes at same cost, giving factor of 1.6 in A/T. Can aim to extend PAFs to outer antennas as evolutionary path.
Aeff/Tsys	~ 10,000 at 1.4 GHz ~7,000 at 10 GHz	Tsys ~ 30K.
Maximum FOV expansion factor for PAFs in inner (<5 km) array	40	Gives ~35 deg^2 at 1.4 GHz. Deliberate limit on beamforming complexity.
PAF beamforming	Digital, in focal package	Ref sig transport TF comparisons
Polarization, max. bandwidth	Dual poln, 2.5 GHz/poln	
Configuration	200 stations, 5 arm spiral. SKA-owned fibre network inside 150 km diameter. 3000 km max baselines. 20 antennas/station. 2000 antennas inside 5 km dia. Stn placement to be agreed.	Maybe push owned array to 250 km after prelim cost study
Signal aggregation	All antennas inside 5 km array individually correlated	Maybe push limit out depending on prelim correlator affordability study
Station size	< 150 m diameter, random element placing	Small as possible given unshadowed 30 deg elev limit
Computing and software	Capped at €150M	Initial complexity limitations, and plan for evolving capability, to be stated and accepted as part of SKA specification
Innovation path: 0.3-1 GHz dense aperture array (AA), centrally concentrated. Initial area Number of independent FOVs	 100 000 m^2 (physical) 8	 With Tsys=50K, 75% aperture efficiency, gives single FOV sensitivity equal to Arecibo. Aim to expand area as cost of AA falls.