

Working Group on Station Antenna and Beam Forming

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1. The working group firstly discussed various performance parameters of different proposals that were listed in the Report at the Jodrell Meeting and updated the report (Enclosure 1).
2. It was noted that Allen Telescope Array (ATA) and LOFAR are likely to become operational in 4 to 6 years from now respectively, and will develop many new technologies which will be of direct relevance to the SKA project. Similarly work being carried out on phased arrays (e.g. THEA) at ASTRON in Netherlands, development work for e-MERLIN and planned expansion of VLA in phase I and phase II will provide valuable inputs for the SKA engineering, no matter what is the final design of the SKA antennas. Similarly rapid development in other fields such as telecommunications and continuing Moore's law for development of ICs and chips should be taken note of.
3. In Enclosure 2 are summarized progress made by various groups in the oral and poster presentations at the Berkeley SKA meeting.
4. The Working Group recommends as follows:
 - a. Progress Reports: Each group working on possible designs for the SKA antennas, front-end electronics and beam forming should submit an Annual Report to EMT and ISSC by June 1 of each year. It is important that each group should describe expected performance of the antenna system in different frequency ranges, such as expected sensitivity ($A_{\text{eff}}/T_{\text{sys}}$), sky coverage in declination, multi-beaming capability in the field of view of the antenna elements, over small or large area of the sky.
 - b. Spread Sheet: S. Weinreb and L.D'Addario have developed a spread sheet for evaluating cost of various sub-systems, such as antennas, electronics, control system, on-line data processing, civil engineering etc. This spread sheet is being available on the Web and could be adopted or suitably modified, which will allow inter-comparison of matrix of sub-space of straw man's design and cost of various proposals in 3 to 4 years from now. ISSC is requested to appoint a system engineer at an early date for interaction with various groups.
 - c. Year of Demonstration: Considering that work on various proposals is still in feasibility stage, the Working group recommends the following time scales:
 - i. Detailed Study Report and Year of Demonstration by each group: 2005
 - ii. Evaluation by EMT/ISSC and short listing of designs by 2006
 - iii. Detailed Engineering of prototypes for evaluating their performance and cost: 2006-2009
 - iv. International agreements and fund raising: 2008-2010
 - v. Start Construction: 2010

5. The Working Group on Antenna system also recommends a closer interaction with the correlator group. Considering the work already done by various groups, although still in preliminary development phase, the Working Group seems confident that cost-effective solutions are likely to emerge over the next few years for the SKA antenna system. However, the choice of antenna system will strongly depend on the science requirements in different frequency ranges. Over the next couple of years, the Science Working group should define the requirements of minimum and preferred sensitivity and other parameters for meeting the most important science objectives. Surely the design of the antenna system for SKA would depend critically on the most important scientific objectives – particularly since cost of antenna system is a major factor for design of SKA.