THE SQUARE KILOMETER ARRAY: MEETING THE DEMANDS OF LOW-FREQUENCY SCIENCE

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The current science case for the international Square Kilometer Array project includes five key science areas: (1) Galaxy Evolution and Large-Scale Structure, including Dark Energy; (2) Probing the Dark Ages through studies of highly redshifted atomic hydrogen and carbon monoxide; (3) Cosmic Magnetism; (4) Probing Gravity with Pulsars and Black Holes; and (5) The Cradle of Life, including studies of protoplanetary disks, organic molecules, and the search for extraterrestrial intelligence.

The technical specifications that follow from the science requirements include very challenging constraints on the configuration, frequency range, field of view, polarization purity, real-time processing throughput, post-processing algorithms, modes of operation, and other aspects of the design. The current plan is to configure antennas in a centrally condensed array out to distances of at least 3000 km. The project is in the process of identifying the best antenna or concentrator that will be based on work being done around the world on small parabolic reflectors; cylindrical reflectors; large adaptive reflectors with aerostat-suspended feed arrays; Arecibo-like reflectors; and aperture arrays. Some of the challenges for the SKA will be addressed by the construction and operation of low-frequency arrays that are now being planned. However, others are explicit to the SKA, including (a) how to cover the 0.1 to 25 GHz frequency range: can it be accomplished with a single antenna type or is a hybrid-array or multiple-array solution inevitable? (b) how can the proposed wide field of view (> 1 deg^2 at 1.4 GHz) be utilized for wide-field spectroscopic and time-domain surveys and for wide-field imaging?

I will discuss the SKA concept with these issues in mind. For specificity, I will often but not exclusively refer to the Large-N, Small-diameter paraboloid concept for the SKA being pursued in the US.

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2. J - Radio Astronomy

3. (a)

4. I - Invited Paper, Program chair: R. Perley

5. for session:¡br¿Large Low Frequency Arrays for Radio Astronomy¡br¿ Comm J, Session chair: Rick Perley