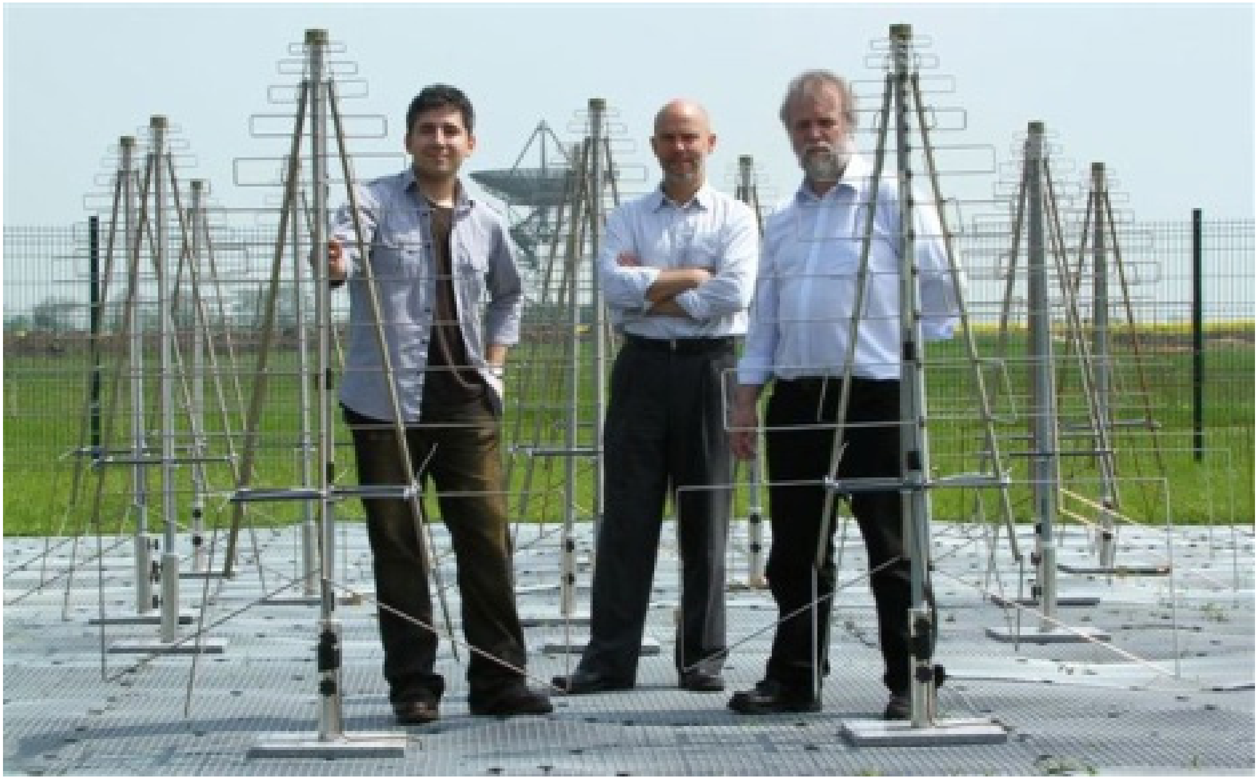
Cambridge Consultants helps take world’s largest telescope out of the lab

Cambridge, MA and UK – July 9, 2012 – The statistics are vast – a central computer with the processing power of 100 million PCs, enough optical fiber to wrap twice around the earth, and raw data to fill 15 million 64 GB iPods every day. So when Cambridge Consultants, a leading technology design and development firm, was tasked with turning an antenna design for the world’s largest radio telescope into a viable product for volume manufacturing, it was no ordinary challenge.

The antennas for the Square Kilometer Array (SKA) have to be easy to assemble in the field and be able to withstand up to 50 years of use, potentially in harsh desert conditions. And millions of them need to be manufactured with no degradation of performance and at the lowest possible cost. When completed, they are expected to produce more than 100 times today’s global internet traffic.



A team at the University of Cambridge designed and tested an antenna that met the performance requirements for the telescope, which will be thousands of times more powerful than existing radio telescopes. But it would be too expensive to manufacture in large numbers. So Cambridge Consultants partnered with the university to produce a version of the antenna with a fully integrated wideband receiver that uses low-cost manufacturing techniques and is simple to assemble and install. This work – which has just been completed – represents a major step towards a production-ready design.

"The challenge of volume manufacture is at the forefront of our work with the SKA program," said Gary Kemp, Program Director at Cambridge Consultants. "The two-meter-tall antennas will have to be manufactured in very high volumes – more than 2.5 million will be required, in addition to the 40 million antennas of the mid-frequency array. So 'commercializing' the design through the design for manufacture process is critical to the feasibility of the SKA. To see a mature design for part of the physical hardware that will make up the core of the world's biggest telescope is an important step towards the construction of the final instrument."

Cambridge Consultants has worked with the SKA project for the last five years, helping to tackle the 'big science' problems involved in designing and building the revolutionary telescope which will enable scientists to probe deep space and address fundamental unanswered questions about the universe. Millions of receivers will be linked together across an area the size of a continent – split between South Africa, Australia and New Zealand. This enormous collecting area will be realized by complementing traditional radio telescope designs with novel aperture arrays.

The SKA will consist of three separate arrays:

- an array of 3,000 dishes, each 15m diameter and looking most like our current impression of a radio telescope, to cover the higher radio frequencies
- a mid-frequency aperture array consisting of 250 separate stations, each containing 160,000 densely-packed receiver elements
- a low-frequency aperture array consisting of a dense core plus a series of out-stations, totaling 2.5 million receiver elements. These will detect neutral hydrogen to explore the early universe, galaxy evolution and the nature of dark energy.

The aperture arrays provide a large field of view and are capable of observing many parts of the sky simultaneously. This 'beam-forming' capability will enable the SKA to achieve survey speeds 10,000 times faster than any existing instrument and the huge collecting area will make it 50 times more sensitive than today's most sensitive instrument – marking the SKA out as a true 'discovery' instrument.

The University of Cambridge is currently testing a small array of 16 low-frequency receivers as a precursor to a series of larger arrays and the SKA phase one deployment of 500,000 antennas from 2016. This will demonstrate that the new, production-efficient design meets the technical requirements that will enable the SKA to deliver the game-changing performance to push scientific boundaries for decades to come.

Dr. Andrew Faulkner at the University of Cambridge said: "Prototyping the initial antenna structure was a significant achievement, given the challenging performance required by the SKA. Working with Cambridge Consultants has made that concept affordable and reproducible. The design is now the most likely basis for deployment in high volume for the SKA."

For more information visit: www.CambridgeConsultants.com [1]