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Fast Radio Bursts and the Square Kilometre Array

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Extended Abstract

Fast radio bursts (FRBs) are amongst the most exciting astrophysical discoveries of the last decade. These bright-yet-brief flashes of radio emission last only a few milliseconds but appear to be detectable to very high redshift. Explaining the progenitor(s) of FRBs is currently a burning question in astronomy, and the focus of much research worldwide at present. In addition to what causes these signals, it has been realised that the signals themselves can be used to perform unique tests of cosmology, as the properties of the Universe imparted upon the signals as they propagate through the cosmos are measurable with radio telescopes. To explain their progenitors and to fully exploit the cosmological applications, one needs to find a large number of FRBs, and to obtain the maximum amount of information per event. This is presently somewhat difficult to do as the instruments which have discovered FRBs to date do not have the optimal combination of sensitivity, field of view and available observing time.

In this paper I will describe the recent developments in FRB science, and how they have influenced the design of the Square Kilometre Array (SKA). The SKA is an observatory in its final design stages; it consists of two component telescopes — a low frequency array operating between 50 and 350 MHz located in Western Australia, and a higher frequency array operating from 350 MHz to 15 (and ultimately to 24) GHz in Southern Africa. Both components will act as highly effective monitors of the transient radio sky, and can be expected to identify a plethora of new discoveries in this relatively unexplored parameter space. The SKA's combination of sensitivity, wide field of view, and commensal observing modes as well as several other key design features, will be tranformational for FRB science.