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# Fast transient radio astronomy with the Square Kilometre Array: fast radio bursts and cosmic rays

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Fast radio bursts are enigmatic millisecond-scale radio transients reaching us from distant galaxies. Their studies are expected to yield information on their necessarily extreme progenitors - young magnetars, merging neutron stars, and/or even more exotic phenomena - as well as the cosmological distribution of gas in our Universe. The SKA promises to yield both the largest and deepest sample of FRBs, and to localise them sufficiently so as to identify their host galaxies. To date, optical observatories - in particular, the ESO's VLT - have been instrumental in these studies. I'll review the current status of FRB astronomy, and speculate on the science that the SKA will be able to deliver.

Decreasing the timescale by a factor of one million, the particle cascades initiated by cosmic rays impacting with the Earth's atmosphere produce nanosecond-scale bursts of radio waves. LOFAR has already shown that radio measurements are the most precise method for studying these particle cascades. The high central density of SKA-low promises to yield the ultimate precision measurements of primary cosmic ray particles and the physics of its interaction, allowing studies of their origin, and physical processes at energies unavailable to terrestrial particle accelerators such as the LHC. I'll focus in particular on the specialist observation mode required to study cosmic rays, and report on recent developments with the Murchison Widefield Array.

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