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Preferred mode of presentation: Poster

Why do we Need “DigiDARN” – A Global Network of Digital SuperDARN Radars?

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The Super Dual Auroral Radar Network (SuperDARN) is an international network of oblique HF over-the-horizon radars dedicated to the study of high latitude magnetosphere-ionosphere convection. In scientific terms, they have been an outstanding success, contributing key observations to more than 500 scientific papers. In recent years, an explosion of technological advances aimed at improving the capability of the radars has begun. As of yet, the standard concept and data products of SuperDARN radars has not been compromised. This presentation argues why a unified fully (i.e. core level) digital re-design of SuperDARN needs to be developed and adopted by the community. A network of “DigiDARN” radars will help to solve data consistency and quality problems, and greatly increase the amount of ionospheric echoes recorded across extended spatial regions through a combination of time and frequency multiplexing, and enhanced, adaptive beam forming. Multi-channel operation will also enable multiple parallel data acquisition streams optimised for the study of different physical processes. The use of field programmable gate array (FPGA) technology will make it possible to operate different virtual radars using the same physical antenna array, thereby enabling experimental research at the cutting edge of modern space physics.