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Opportunities for the Australia Telescope Compact Array (ATCA) to Contribute to Space Situational Awareness (SSA)

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The unabated increase in the number of satellites and society's dependence on them is driving a demand for improving our ability to track satellites and space debris. While purpose-built state and commercially funded capacity is growing to meet this demand, we are asking what role the most sensitive radio-sensors, radio telescopes, can play in this field. There are many examples of radio telescopes contributing to the SSA field, including the Effelsberg 100-m, Sardinia 64-m, Murchison Widefield Array, and Northern Cross radio telescopes. Our team has focused on how the Australia Telescope Compact Array (ATCA) can contribute, with the possibility of SSA being a regular operating mode.

The relevant strengths of radio telescopes lie in extreme sensitivity and signal processing capability. The systems are set up to track celestial objects and so, for the ATCA for example, significant effort is needed to add the capability to track faster moving and closer objects. We have been studying the intersection between needs and the ATCA's capabilities in this field. We have demonstrated tracking satellites using their transmitted signals in several frequency bands and tracking space debris using bistatic radar with the cooperation of transmitters from the Canberra Deep Space Communication Complex (CDSCC).

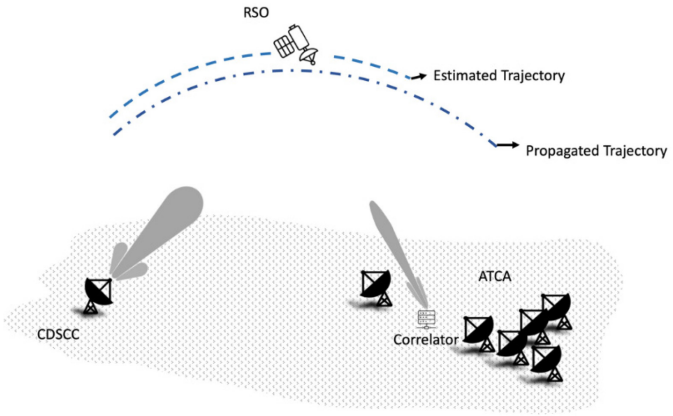

Figure 1: Bi-static configuration, showing the trajectory propagated from the catalogue used as a cue and the revised estimate based on our measurements.

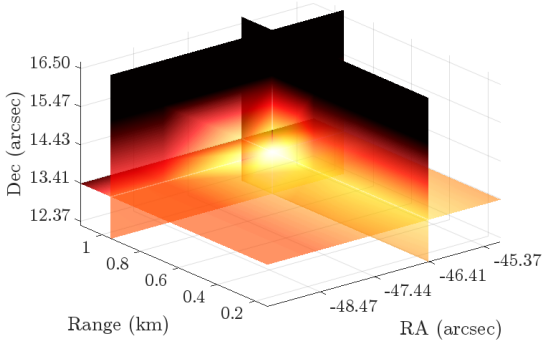

Figure 2: Normalized 3D image around the target's estimated location using interferometry. The image is represented as offsets from the initial coordinate in terms of Right Ascension (RA), Declination (Dec), and Range (in this case 22 263km).