Providing a clearer view of our early Universe

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(Phys.org)—A new data analysis tool will be used by researchers of the ARC Centre of Excellence for All-sky Astrophysics (CAASTRO) at Curtin University to handle large quantities of data coming in from the new low frequency radio telescope, the Murchison Widefield Array (MWA).

The MWA will survey the sky more thoroughly and deeply than ever before in an attempt to detect very faint signals from the Epoch of Reionisation – a little understood early era of the Universe's history, occurring within the first billion years after the Big Bang, when cool atomic hydrogen gas was heated and ionised by the first light-emitting objects in the Universe.

As recently published in *The* Astrophysical Journal, researcher Dr Cathryn Trott and her team at the Curtin Institute of Radio Astronomy have proposed a more accurate method of understanding bright foreground noise that may be obscuring scientists' views of these very faint signals.

They use data from the MWA in a new way that allows them to study and reduce the effects of systematic errors in the data processing pipeline, meaning they increase the sensitivity of the instrument by statistical analysis.

"As with everything, there is a balance to strike; the more sensitive our telescopes, the more signals we are picking up – however not all signals

are of the desired cosmic origin but are actually a contamination of our data from the bright Universe we see today," Dr Trott said.

"On the eve of switching on these new telescopes, we want to make sure we have the best data analysis tools at hand to clean up the inflowing data, one of which is presented in our recent publication."

Dr Trott said previous work wasn't able to define the precise impact of the bright foreground signals on the ability to measure the Reionisation signal.

"As a community, we are beginning to develop some extremely sophisticated methods for finding the needle in the haystack – detecting this crucial period in the early Universe – and the timing is perfect with the arrival of these exciting new telescopes," she said.

The calculations presented in her paper also allowed Dr Trott to evaluate the performance of the actual telescope designs in minimising noise and to predict optimised layouts depending on the experiment of interest.

More information: iopscience.iop.org/0004-637X/757/1/101

Provided by Curtin University

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