Synchronized telescope dance puts limits on mysterious flashes in the sky

30 October 2018

This is an outlying tile of the MWA telescope, located about 1.5km from the core. The Moon lights the tile and the ancient landscape. Credit: Pete Wheeler, ICRAR

Two outback radio telescopes synchronised to observe the same point of sky have discovered more about one of the universe 's most mysterious events in new research published today.

The Curtin University-led Murchison Widefield Array (MWA) and CSIRO's Australian SKA Pathfinder (ASKAP) telescopes were searching the sky for fast radio bursts, which are exceptionally bright flashes of energy coming from deep space.

These extreme events last for only a millisecond but are so bright that many astronomers initially dismissed the first recorded fast radio burst as an observational error.

In research published in the *Astrophysical Journal Letters*, astronomers describe how ASKAP detected several extremely bright fast radio bursts, but the MWA—which scans the sky at lower frequencies—did not see anything, even though it was pointed at the same area of sky at the same time.

Lead author Dr. Marcin Sokolowski, from the Curtin University node of the International Centre for Radio Astronomy Research (ICRAR), said the fact that the fast radio bursts were not observed at lower frequencies was highly significant.

"When ASKAP sees these extremely bright events and the MWA doesn't, that tells us something really unexpected is going on; either fast radio burst sources don't emit at low frequencies, or the signals are blocked on their way to Earth," Dr. Sokolowski said.

Study co-author Dr. Ramesh Bhat, who is also based at ICRAR-Curtin, said it required considerable co-ordination to get the CSIRO-led ASKAP telescope and Curtin-led MWA telescope pointed at the same area of sky at the same time.

Both telescopes were able to capture the same view because the two telescopes are located side-by-side in the desert of Western Australia's remote Murchison region.

"Fast radio bursts are unpredictable, so to catch them when both telescopes are looking in the same direction isn't easy," Dr. Bhat said.

"It took many months of ASKAP and the MWA co-tracking the same area of sky, ensuring the best overlap of their views possible, to give us the chance at catching some of these enigmatic bursts.

"The challenge was in making it all happen automatically, but it really paid off."

ICRAR-Curtin astronomer Dr. Jean-Pierre Macquart, also a co-author of the research, said fast radio bursts have perplexed astronomers ever since the first burst was discovered in 2007.

"It's really thrilling to have a clue about the origins of these incredible bursts of energy from outside our galaxy," Dr. Macquart said.

"The MWA adds an important piece of the puzzle and it was only made possible with this 'technological tango' between the two telescopes.

"It's an exciting development because it unites the two teams and it brings home the advantage of having the two telescopes at the same site.

"Future coordination between the teams will also benefit other areas of astronomy, as complementary views from the two telescopes can provide a more complete picture of a situation."

More information: M. Sokolowski et al. No Low-frequency Emission from Extremely Bright Fast Radio Bursts. *The Astrophysical Journal Letters*, Volume 867, Number 1. 2018 October 29.

Provided by International Centre for Radio Astronomy Research