The benefits of the Australian mixed-mode program (2018 - 2023) for the celestial reference frame at S/X-band

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Abstract

The current realization of the International Celestial Reference Frame at 8.4 GHz, the ICRF3-SX, is computed from Very Long Baseline Interferometry measurements starting in 1979 until March 2018. The concentration of the majority of VLBI telescopes in the Northern Hemisphere reflects itself in the unequal distribution of observations to radio sources over declination which causes the ICRF3-SX to be weaker in the south. One of the current VLBI observing programs active in the Southern Hemisphere is the Australian mixed-mode program (AUM) which started to be organized in July 2018.

In this presentation, we show the benefits of the AUM for the celestial reference frame and also discuss its current limitations. We concentrate particularly on a block of dedicated 24-hour sessions scheduled between August 2022 and April 2023 (AUM49-72) which were prepared with the aim to observe target sources in the south, that have a low number of observations in ICRF3-SX. The individual sessions were scheduled for currently available VLBI telescopes (Hb, Ke, Yg for the first block, then also including Ho and Ww in the second block in 2023). In terms of scheduling, the sessions were scheduled geodetically, i.e. aiming for a high number of scans. In each session, five target sources were observed in 4-5 scans of 10 minutes duration. This setup still ensures about 25 scans/hr/station, which is seen as a foundation even for good geodetic results.

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