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The structure of the radio source 0642+449 detected from CONT14 observations

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Content :

The CONT14 campaign features state-of-art VLBI data. Therein, the radio source 0642+449 was observed with about one thousand observables each day during the continuous observing period of fifteen days, providing tens of thousands of closure delays, the sum of the delays around a closed loop of baselines. The closure delay is independent of the instrumental and propagation delays and provides valuable additional information about the source structure. An example of the use of this new “observable” for the determination of source structure is given for the radio source 0642+449. This source, as one of the defining sources in the second realization of the International Celestial Reference Frame (ICRF2), is found to have two point-like components with separation of 425 milliarcseconds in right ascension and 47 milliarcseconds in declination. The two components are almost equally bright with the flux-density ratio up to 0.92. With the help of recent space VLBI observations at 1.6 GHz, the morphology of 0642+449 could be identified to some extent. The closure delays larger than 1 ns are found to be caused by the source structure as well, demonstrating the structure effect of a source with this simple structure could reach up to tens of nanoseconds, at least one magnitude larger than expected. We anticipate our study to be a starting point for more effective determination of the structure effect in VLBI observations without the involvement of radio source images.

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