# NEAR detection confirmation around $\alpha$ Cen A with K-Stacker

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**Résumé**

The search for life on Earth-like planets is one of the primary goals of modern astronomy. In 2019, a total of 100 hours of observation were allocated with VLT/VISIR NEAR, a collaboration between ESO and the Breakthrough Initiatives, to search for low mass planets in the habitable zone of the $\alpha$ Cen AB binary system. A weak signal (S/N $\sim$ 3) was reported around $\alpha$ Cen A, at a separation of 1.1 au which corresponds to the habitable zone. A confirmation of this detection would have very important implications for the presence of other planets in the habitable zone of $\alpha$ Cen A. We have re-analysed the NEAR data using the Keplerian-Stacker algorithm. Based on a brute-force algorithm, K-Stacker combines multiple observations acquired at different epochs and takes into account the orbital motion of a potential planet present in the images to boost the ultimate detection limit. Out of 4e+5 orbits tested by the algorithm, we find only a single planet candidate, which matches the C1 detection reported in Wagner et al. (2021). More observations will be necessary to confirm that it is indeed a planet and not a disk or other data artifact. We also propose to revize direct-imaging observing strategy: instead of concentrating all the data around a single epoch (for a simple stacking of the images), we recommend that the observations be split around several epochs, covering as much of the orbital period as possible, and then re-combined using K-Stacker to better constrain the orbital parameters. This K-Stacker strategy will allow to better constrain the orbital parameters and to schedule observations only under excellent weather conditions, in order to reach the ultimate contrast. It will aid in the search for Earth-like planets in the habitable zone of the nearest stars with future instruments of the E-ELT such as METIS.

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