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# VLBI with the SKA: a step forward for truly Global VLBI

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VLBI networks are a great scientific tool to strengthen global collaboration, promote human capital building and develop new technologies. With the synthesis of a telescope the size of Earth, VLBI provides (sub-)milliarcsecond angular resolution and ~10 microarcseconds relative astrometric precision at cm wavelengths, and event-horizon scales in supermassive black holes at mm and sub-mm wavelengths [1], key features to perform transformational science in the multi-messenger scene.

The IAU Commission B4 has formed a working group to establish a Global VLBI Alliance (GVA), to foster a truly global collaboration for VLBI with the involvement of all the major VLBI networks: the Very Long Baseline Array (VLBA), the European VLBI Network (EVN), the East Asian VLBI Network (EAVN), and the southern hemisphere Long Baseline Array (LBA). The Alliance will be a permanent forum to share information and strategies on science and technology roadmaps, facilitating and supporting coordinated observations of the established VLBI networks and will act as a single point of contact for third-party instruments and non-experts users.

The Alliance will coordinate the VLBI networks to work together with other instruments, in particular next generation radio telescopes in a global VLBI effort. An outstanding example is the inclusion of the SKA telescopes in the VLBI networks, supported by the EC Horizon 2020 JUMPING JIVE project. VLBI with the SKA brings new capabilities, such as sensitive multi-beam observations, with a breed of new science cases [2]. As part of the effort, an operational model for inclusion of the SKA in Global VLBI has been elaborated [3]. Innovative operational modes such as those used by the e-EVN, the SKA pathfinder real-time EVN network, or a proposed 'EVN-subarray' concept where a subset of EVN telescopes would observe with a more regular and flexible schedule will contribute to better alignment of the VLBI networks with the SKA operational model, that will employ dynamic scheduling.

The capability to quickly respond to transient events with a more flexible global VLBI array is becoming more and more important. VLBI has already proved invaluable for the study of a range of astrophysical transients, from the counterparts of gravitational waves [4], to the still elusive Fast Radio Bursts [5], and more. For all of these transients, the combination of high precision astrometry, large field of views, and the enhanced sensitivity provided by SKA-VLBI together with fast response, will provide unique and essential information for tackling the astrophysics of these sources and using them as tools for cosmology.

1. EHT Collaboration, "First M87 Event Horizon Telescope results", *The Astrophysical Journal*, **875**, 1, 2019, pp. L1, doi: 10.3847/2041-8213/ab0ec7.

2. C. Garcia-Miro et al., "VLBI with the Square Kilometre Array", *Proceedings of the XXXIVth URSI General Assembly,* Rome, Italy, 2021, in preparation.

3. C. Garcia-Miro et al., *JUMPING JIVE Project*, "D10.2 Operational model for inclusion of SKA in Global VLBI ", 2020, public url: http://jumping.jive.eu/exec/d10.2.pdf.

4. G. Ghirlanda et al., "Compact radio emission indicates a structured jet was produced by a binary neutron star merger", *Science*, **363**, 6430, March 2019, pp. 968-971, doi: 10.1126/science.aau8815.

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