Towards a Global VLBI Alliance

Initial version by F. Colomer & H. Kobayashi, October 2019

1. Motivation

By its very nature, VLBI has always depended on international collaborations. These have led to the formation of several formal VLBI networks, which in turn regularly form combined arrays. “Global VLBI” is the term used for the coordinated observations of the European VLBI Network (EVN) and the Very Long Baseline Array (VLBA). In the past, the “Global VLBI Working Group” (GVWG) worked as an umbrella for the space VLBI and ground VLBI network collaboration (VSOP), organizing the logistics (time allocation of ground network resources was agreed in the GVWG) and technical compatibility.

Nowadays, as several independent VLBI networks and instruments exist, it becomes timely to establish a Global VLBI Alliance (GVA) to facilitate the flow of information between VLBI networks, including sharing strategies, technical developments for compatibility, logistics, operations, and user support. Possibly it will also promote, propose and coordinate common observational campaigns with these existing networks. All these topics have their own characteristics, and appropriate procedures to address them will have to be established. Moreover, with the advent of the Square Kilometer Array (SKA) and its precursors, such global coordination of the various networks and their participating telescopes will be required. The Next Generation Very Large Array (ngVLA) may also collaborate with a global VLBI array. In such scenario, the GVA will serve as contact point and framework of collaboration of the VLBI networks and these other facilities. Additionally, it can encourage and support new VLBI activities (like the African VLBI Network - AVN, Iniciativa VLBI IberoAmericana - IVIA, developments in southeast Asian countries, etc.).

The GVA will also facilitate that adequate information is provided to the users. For this, a unique common portal would explain the characteristics of the different networks, and the options for users to access them or in combination.

2. Membership

The following VLBI networks working at cm/mm wavelengths (with a number of common frequency bands) have shown interest:

- The European VLBI Network (EVN),
- The East Asian VLBI Network (EAVN), comprising the Korean VLBI Network (KVN), the Japanese VLBI Exploration of Radio Astrometry (VERA) telescope, and the Chinese VLBI Network (CVN),
- The Australian Long Baseline Array (LBA)
- The Very Long Baseline Array (VLBA)
- The Global Millimeter VLBI Array (GMVA)

Additional VLBI instruments, observing at other frequency ranges, may also be interested:

- The International LOFAR Telescope (ILT)
- The Event Horizon Telescope (EHT)
- The International VLBI Service for Geodesy and Astrometry (IVS)

The Square Kilometer Array Organization (SKAO) should be aware and involved in the discussions.

3. Structure

The Global VLBI Alliance will deal with challenges regarding several subjects:

a) Governance
b) Technology
c) Operations and Logistics
d) User support

4. Governance

The GVA will be a forum where representatives of the different member networks meet to promote network collaborations and share information, strategies and plans for future developments.

Preliminary meetings have already taken place with representatives from some of the networks mentioned. The current plan is to formalize the GVA through a MoA, and to decide upon a procedure to elect a Chairperson and a Spokesperson.

The GVA Board will meet regularly (2-3 times per year), mainly by teleconference.

5. Technology

Coordination in technological developments, essential to ensure compatibility among networks, already exists to some degree. Each network includes a technical working group in its structure (e.g. the EVN Technical and Operations Group, TOG). These working groups regularly meet and moreover, some activities are organised jointly (like the International VLBI Technology Workshops, IVTW, that bring together representatives from the EVN, the VLBA, the IVS, etc).

Present and future compatibility, as well as the alignment of technical developments, require timely information flows between the networks. This can be achieved by continuing and expanding the activities currently in place, and by setting up regular meetings of representatives of each network.

6. Operations and logistics

One very important aspect of a Global VLBI Alliance is the possibility to arrange joint observations among networks. With new wide-band receivers providing common frequencies and technical compatibility continuously improving, users should be able to select the array best suited to their science goals.

Evaluation of proposals is done by Time Allocation Program Committees (TAC / PC). Nowadays, EVN + VLBA observations require separate evaluations by each TAC. This model could be maintained, or alternatively, a unique GVA TAC could be established to evaluate any joint observations. It is expected that observation campaigns with more than two networks will be exceptional. However, it is possible that some science projects will require the participation of several networks at the same or different epochs; such cases would require the coordination offered by the GVA. Alignment of proposal deadlines and use of the same proposal tool would also facilitate access to the combined global network.

Aspects such as availability of recording media and correlation of joint observing campaigns will have to be dealt with by the GVA partners.

7. Users support and scientific cross-collaborations

The VLBI technique is still often considered complicated (“black belt”), and appropriate user support is essential. This is currently offered by each network independently, with the exception of some training events which involve several networks (e.g. the European Radio Interferometry School, ERIS).

Since the VLBI networks are “open skies” facilities, the community of VLBI users is global. It would then be beneficial that each network has sufficient knowledge of the characteristics of the other networks in house, so that users can receive support locally. For example, European users should be able to receive support from the EVN/JIVE when using the EAVN, and vice versa.

Additionally, the GVA will facilitate scientific interchange. Consideration of a VLBI user community at global scale can be achieved by promoting participation of scientists in conferences and workshops, where results obtained with any network are presented. The GVA could establish some budget to facilitate travel.

8. Timeline

Different aspects of the Global VLBI Alliance will have different timelines. Some are described here:

a) Governance:
    - October 2018: Face-to-face meeting of VLBI network representatives (Granada, Spain)
    - September 27 2019: Discussion of the GVA concept at the meeting of the EAVN Directors Board (Mito, Japan)
    - November 13 2019: Discussion of the GVA concept at the meeting of the EVN CBD (Dwingeloo, Netherlands)
    - December 2019: Teleconference of representatives of the networks interested.

b) Technical:
    - May 2020: Regular meetings of the EVN and GMVA TOGs (Bonn, Germany)
    - TBD: Next IVTW
    - Early in 2020: Teleconference of the chairpersons of various TOGs.
c) Operations and Logistics
    - Early in 2020: Teleconference of the chairpersons of the TACs, in particular, to discuss possible alignment of proposal deadlines, and options for GVA proposal evaluation.
    - Early in 2020: Scheduling of a teleconference of representatives from the correlators of interested networks, to discuss how to transfer data and distribute the load of joint observations.
    - February 2020: Inclusion of the announcement of availability of joint observations in the Call for Proposals, for first observations in autumn 2020(?).
d) User support and scientific cross-collaboration
    - February 2020: Creation of an access point for GVA with information and links to the different components, and the possibilities for observations with combined networks.
    - February 2020: Listing of the different events (conferences and workshops) and distribution of the announcements to all the communities of users.