



A 3-element portable radio interferometer for 6.7 GHz methanol observations in the Southern Hemisphere

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In the context of the development of instrumental for radio astronomical observations, the size of the antenna used for observations in the S and C frequency bands that allow for an angular resolution equal to or less than 1 degree is significantly large to consider portability, understanding portability as the ability to change the geographical location (latitude and longitude) in time intervals of assembly and disassembly less than one working day.

A technical solution to the large size of an individual antenna to obtain the necessary angular resolutions in the aforementioned bands is to apply radio interferometry, which is proven and effective, where the distances between the elements of the interferometer allow for the determination of the angular resolution of the area of interest to be observed and the smaller size of the elements helps portability.

Within this context, a 3-element radio interferometer is being developed where each element is a 3.1-meter diameter parabolic antenna in C-band (with mesh surface). The minimum distance between the antennas will be 20 meters in a triangle formation. Each antenna will have an integrated altazimuth positioning system that allows for movement from 0 to 180 degrees in elevation and 360 degrees in azimuth. The system uses a Correlator and a proprietary positioning system with an RF reception chain oriented toward observations in band C.

The motivation of the project is the observation of methanol maser radio sources at 6.7 GHz [1] in the southern hemisphere, with the first geographical objective being the high Andean zone of the Tacna department located in southern Peru at an altitude of more than 4500 meters above sea level and 17 degrees S latitude. Subsequently, the interferometer is sought to be installed at Macchu Picchu Peruvian scientific Antarctic base, proposing it as part of the base development as part of the Peru-Antarctic project. To easily move the interferometer, the portability of the system becomes a necessity for transportation, installation, observation, and subsequent disassembly and dismounting. Each unit will have a wheel system adapted to the geographical conditions of the place and allow for the stability of the interferometer element without affecting the measurements.

The project is already in its construction phase and open to new scientific objectives such as the detection of transient radio astronomical phenomena, observations in the S-band, and continuous observations of radio sources in the southern hemisphere.

References

- [1] M. R. Pestalozzi, V. Minier, and R. S. J. A. Booth, "A general catalogue of 6.7-GHz methanol masers ***, " vol. 432, no. 2, pp. 737-742, 2005, doi: 10.1051/0004-6361:20035855