



## **Observing the low frequency radio sky with the Aperture Array Verification System 2: initial performance characterization of the SKA-Low station prototype**

G. Macario<sup>\*(1)</sup>, G. Pupillo<sup>(2)</sup>, G. Bernardi<sup>(2)</sup>, P. Bolli<sup>(1)</sup>, G. Comoretto<sup>(1)</sup>, P. Di Ninni<sup>(1)</sup>, A. Mattana<sup>(2)</sup>, J. Monari<sup>(2)</sup>, F. Perini<sup>(2)</sup>, M. Schiaffino<sup>(2)</sup>, J. Broderick<sup>(3)</sup>, M. Sokolowski<sup>(3)</sup>, R. Wayth<sup>(3)</sup>, R. Subrahmanyam<sup>(4)</sup>, S. Asayama<sup>(5)</sup>

- (1) INAF Arcetri Astrophysical Observatory, Florence, Italy; e-mail: giulia.macario@inaf.it, pietro.bolli@inaf.it, giovanni.comoretto@inaf.it, paola.dininni@inaf.it
- (2) INAF Institute of Radioastronomy, Bologna, Italy; e-mail: giuseppe.pupillo@inaf.it; gianni.bernardi@inaf.it, andrea.mattana@inaf.it, jader.monari@inaf.it, federico.perini@inaf.it, marco.schiaffino@inaf.it
- (3) International Centre for Radio Astronomy Research, Curtin University, Perth, Australia; e-mail: jess.broderick@curtin.edu.au, marcin.sokolowski@curtin.edu.au, R. Wayth@curtin.edu.au
- (4) Space & Astronomy CSIRO, Kensington, Australia; e-mail: Ravi.Subrahmanyam@csiro.au
- (5) SKA Observatory, Jodrell Bank, Lower Withington, Macclesfield, UK; e-mail: Shinichiro.Asayama@skao.int

SKA-Low is the low-frequency telescope of the SKA Observatory, being built at the Murchison Radio-astronomy Observatory (MRO) site in Western Australia. Operating in the frequency range 50 – 350 MHz, the Fourier Synthesis telescope is an assembly of phased aperture arrays with no moving parts. In its current design, SKA-Low will consist of more than 130,000 fixed antennas, arranged into 512 stations. Each station will be composed of 256 SKALA4.1 dual-polarization log-periodic antennas, pseudo-randomly distributed within a circular area of about 40 m diameter.

The Aperture Array Verification System 2 (AAVS2), operational since late 2019, is a full-size engineering prototype station deployed at the MRO site in the lead up to the start of the SKA-Low construction. An assembly of six stations like AAVS2, to be built in the next three years, will form the first production prototype of the SKA-Low telescope.

We present system tests of the AAVS2, performed through the analysis of data from commissioning observations at selected frequencies distributed over the SKA-Low band, aimed at characterising the system performance. We describe calibration procedures, present the resulting all-sky images, and discuss station calibratability, system stability and sensitivity. Moreover, we present preliminary results on the station polarization performance derived through the analysis of Stokes images from interferometric observations.

These initial observational results are so far very promising, and allow for a partial validation of AAVS2 station model and performance: an important step towards SKA-Low telescope construction and science.