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ACTIVE ANTENNAS FOR THE NEXT GENERATION OF LOW-FREQUENCY RADIO TELESCOPES

Abstract

The Southern Regional Space Research Center – CRS/CCR/INPE-MCT in collaboration with the Santa Maria Space Science Laboratory – LACESM/CT-UFSM, in Santa Maria, RS, South of Brazil, are interested in developing low frequencies radio telescopes and radio interferometer systems based on the concept of phased array interferometric stations. Based on results from previous works, it is reasonable to conclude that the Southern Space Observatory's (SSO) Site has an electromagnetic characteristic compatible with that of the sites of the European LOw Frequency Array – LOFAR. Currently, an interferometric array similar to the LOFAR Prototype Station – LOPES and to the Eight-meter-wavelength Transient Array – ETA is being developed by using active antennas, more specifically thin inverted-V dipole antenna, which is designed to cover the frequency range under 100 MHz of LOFAR. This paper presents the design and evaluation of an active antenna for a prototype interferometric array which is being developed at the site of the Southern Space Observatory – SSO/CRS/INPE-MCT (29.4 ^{o}S, 53.8 ^{o}W, 480m a.s.l.), in São Martinho da Serra, approximately 54 km distant far from the city of Santa Maria, in Rio Grande do Sul state, South of Brazil. The next generation of large telescopes for radio astronomy at low frequency, below 100 MHz, will consist of thousands of wide-band dipole-like antennas. At this frequency range, the sensitivity of a telescope is limited by the Galactic Noise, for that a thin inverted-V dipole design was combined with a simple active balun in order to provide the necessary sensitivity to cover the sub-100 MHz frequency range of the LOFAR and also it can allow a high useable bandwidth. The results are consistent with those obtained from a recent theoretical analysis and first results obtained from LOPES and ETA radio telescopes.