

V118c Study of surface alignment for Tsukuba Antarctic 10-m radio telescope by near field phase retrieval holography

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Some previous researches indicate that phase retrieval holography (PRH) in near-field could be utilized to estimate the large reflector antenna's main surface with relative high SNR, which is advantageous for high-precision alignment. And in view of the extreme environment and finiteness conditions of supply on Antarctica, we are considering to adopt PRH in near field to estimate 10-m THz telescope's primary surface accuracy, the target value is $20\mu m$ rms deviation.

In near field holography, the path-length of all rays from an emitter to antenna are not equivalent, which result in phase error during measurements. Some research showed details to derive the relative formula of phase error for phase correction of paraboloid reflector or Cassegrain telescope. However, 10-m THz telescope is Ritchey-Chrétien (RC) telescope with hyperboloid surface, and the formulas should be converted in this case.

In this research, we will show the basic flow of near field phase retrieval holography. Specifically, we will list the way of path-length error calculation for RC telescope by utilizing the relative equivalent paraboloid surface of 10-m telescope, and the procedure to convert the Misell-algorithm (PRH algorithm) from far-field into near-field. This study is significant as the preliminary research for future surface accuracy measurements of 10-m THz telescope or other RC style antennas.