



Antenna Pointing Calibration Based On Cubic Radiation Pattern And Cross Scan

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To get good antenna tracking pointing accuracy under unperfect measurement link status of complicated system, methods and measurements of cubic radiation patterns and cross scanning-and-tracking are proposed for the two 20m Az-El antennas, which will be updated to take part in the observation and calibration of Mingantu Spectral Radioheliograph (MUSER), a powerful instrument dedicated for solar radio imaging observing. The Sun, Cyg A and navigation satellites are used as possible radio sources to be scanned to get their cubic radiation patterns with MUSER-I receiving system. Results show that the cubic radiation patterns of satellites and Cyg A are not ideal, because of big differences between the two polarizations and big differences on multiple frequency channels. So at last, the Sun is used as radio source to calibrate the tracking pointing accuracy of the 20m antenna. Based on the cubic radiation patterns and cross scanning-and-tracking results, least square method is used to obtain the 8 parameters of the 20m antenna’s pointing model. After calibration, the pointing accuracy is improved from about 12' (rms) to about 4.4' (rms), this testifying the reliability of the proposed methods and providing a good reference for other complicated telescope systems. Scan grid of antenna cubic radiation pattern centered of target and an example of 20m’ cubic radiation pattern and cross scanning and tracking along solar orbit obtained with MUSER-I receiving system are given in figure 1. Power output of west 20 m antenna cross tracking and scanning the Sun before calibration (on Mar.15, 2018) and after (on Mar.16, 2018) calibration of pointing are shown in figure 2.

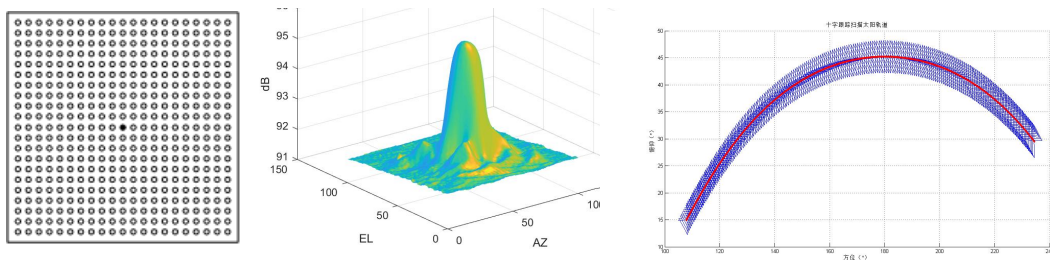


Figure 1. Scan grid of antenna cubic radiation pattern centered of target, an example of 20m’ cubic radiation pattern and cross scanning and tracking along solar orbit

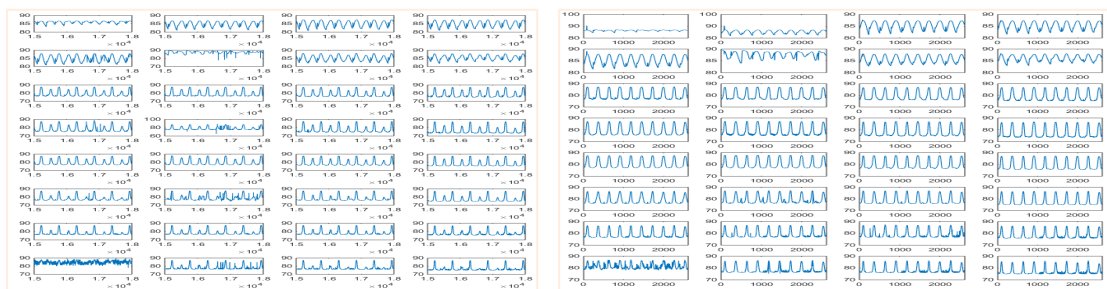


Figure 2. Power output of west 20 m antenna cross tracking and scanning the Sun before (20180315) and after (20180316) calibration of pointing

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