Modification and Identification of the Beam Waveguide Antenna Control System Model

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This work is the first step toward increasing the bandwidth of the NASA/JPL 34 meter beam waveguide (BWG) antenna position loop controller. A wider bandwidth of the controller allows for faster tracking rates and better pointing performance under windy conditions. To achieve this goal the antenna control system model must accurately reflect the dynamic properties of the antenna.

The position controller at the 34 meter beam waveguide antenna located at Goldstone, California does not currently employ a model-based control law. In the interest of implementing model-based control, an analytical model was developed, and an experiment was designed to gather data at the 34 meter BWG antenna. The data was used to modify the analytical model, and to identify a new antenna model using SOCIT software of NASA Langley Research Center. The empirical transfer function and the transfer function of the identified model compared in Figure 1a,b show good coincidence.

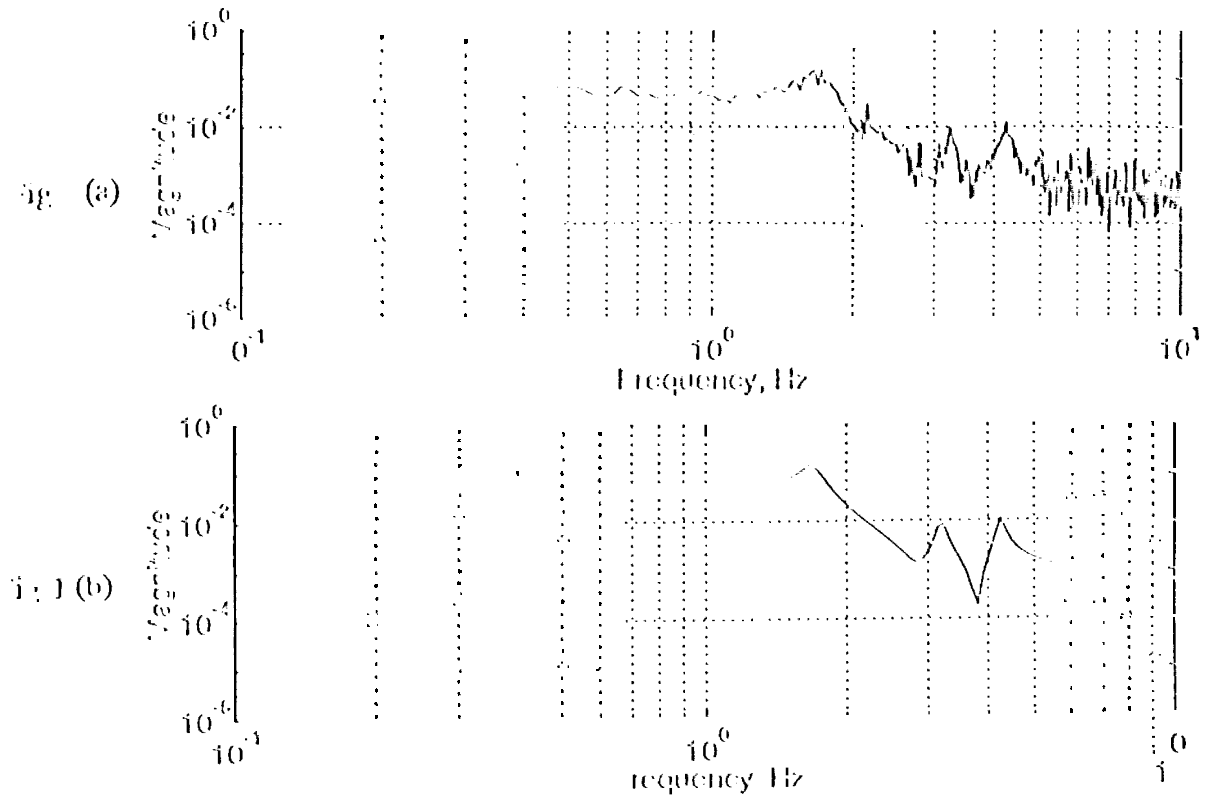

Fig. 1. Transfer function of the antenna (azimuth I/O): (a) estimated from the collected data, and (b) obtained from the identified model.