

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
Mobile Satellite Communications and Navigation Technology (3)

Author: Dr. Dong Chen

China Academy of Space Technology (CAST), China, phd.dchen@gmail.com

Mr. Naijin Liu

China Academy of Space Technology (CAST), China, naiking@gmail.com

ANTENNA POINTING MEASUREMENT AND PRECISION ANALYSIS FOR GSO MOBILE  
COMMUNICATION SATELLITES

**Abstract**

Due to the more narrow communication beams, the antenna pointing accuracy of GSO mobile communication satellites is becoming increasingly important. Antenna design can be optimized by improving the pointing accuracy which will lead to better gain performance or decrease the interference to adjacent areas.

In this paper, the antenna pointing problem for GSO mobile communication satellites is discussed to provide a solution to the pointing measurement. According to some actual statistics, the antenna pointing measurement problem is firstly modeled as a detection and estimation problem under several assumptions. The measurement process is performed in two steps: In the first step, a primary decision gives the sign of the pointing error which provides a larger measurement range. And then, a fine measurement is performed in a narrower range in the following step. In the satellite-earth loop, the pointing measurement process is conducted on the ground to simplify the payload on the satellite. Thus the open loop attitude control is performed on the satellites to maintain an acceptable pointing accuracy. Finally, an alternative realization with a single communication beam is proposed.

Based on the proposed method, the pointing calibration accuracy is analyzed. The probability density function of the measurement error is given. With a practically designed communication beam pattern whose half-power beam width is about 0.6 degree, primary simulation shows that, the proposed antenna pointing measurement method can provide an accuracy of 0.02 degree.