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MULTIBEAM ANTENNA POINTING MEASUREMENT BASED ON COMMUNICATION BEAMS
FOR COMMUNICATION SATELLITES

Abstract

With the technical development of the communication satellites and the wide application of multibeam antennas, the antenna pointing control problem is becoming increasingly important. The traditional pointing measurement utilizes several beams, which occupies lots of satellite resources.

In this paper, a maximum likelihood estimation of the antenna pointing based on communication beams is proposed, which reduce the beam pointing measurement requirements on satellite. The estimation performance is analyzed which gives the pointing measurement precision and error distribution. The pointing error is composed of calibration error and estimation error, while the pointing error follows normal distribution. Simulation results show that the precision improvement slows down due to the calibration error when SNR is greater than 20dB, and the worst precision is not better than $0.1(3\sigma)$. Moreover, the performance is largely affected by channel stability when the uncertainty is greater than $3dB(3\sigma)$. in our simulation.

Considering the effects on pointing measurement accuracy of the channel stability, an improved robust method is given in our discussion. It utilizes another beacon beam to calibrate the pointing measurement results, which can eliminate the performance descent due to the channel uncertainty. Simulation shows that this improved method is insensitive to the channel stability and can provide a stable measurement performance similar to the traditional method.