

## Estimation of spin rate of AJISAI satellite from spectral analysis of laser ranging data

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A new approach to measure the spin motion of artificial satellite was devised. Some laser ranging targets such as Japanese Ajisai satellite have a cyclic pattern in the arrangement of corner cube reflectors. This effect has been recognised just as a noise source, but we successfully utilised it. We detected the slowdown of Ajisai's spin rate by the spectral analysis of laser ranging full-rate data.

We devised a new approach to research satellite orientation. The spin rate of the geodetic satellite Ajisai was derived through a spectral analysis of laser ranging data obtained by precise high-return-rate tracking stations. This new analysis method utilises the directional dependence of the target optical depth resulting from the sparse distribution of corner cube reflectors on the satellite surface.

The third and sixth harmonics of the spin rate were found to be dominant in the pass-by-pass spectral analysis of the full-rate range residuals from multi-photon laser ranging systems. Accumulating hundreds of passes, the analysis results gave the slowdown of Ajisai's spinning from 1997 to 1998. The spin rate, 0.567 Hz as of 1998.0, and its trend, -0.0086 Hz/year, were almost identical to the conventional flash observation.

Although the spin rate derived from this method was not as precise as the conventional one, it can provide global spatial coverage and continuous time coverage to monitor the spin motion.