

1.8 Survey of SLR Telescope Reference Point

(1) Survey method

- 1) In 1999, the method of positioning the reference point of SLR telescope has been changed to “indirect method”, since the setting of survey target at the reference point has been found to be inadequate when the survey has been conducted by “direct method” in 1997 and 1998.
- 2) The indirect method applied here was a method to measure the survey targets placed near the reference point of SLR telescope from the three long pillars by using TS. AT each long pillar, the azimuth angle of SLR telescope has been adjusted to face the long pillar, and observations are made while SLR telescope is rotated to three positions along its elevation axis with an interval of approximately 45 deg. In this way, nine positions of the target on a sphere are gained. The method of least squares was applied to calculate the positioning coordinate of the spherical center (reference point) from these nine position’s coordinates.
- 3) However, at Koganei station, instead of using the long pillars (L1, L2, L3), base points (X1, X9, X10) have been used as the instrument points of TS. And at Tateyama station, base point (X1) has been used as the instrument point of TS instead of the long pillar (L3).

(2) Survey results

- 1) As displayed in Table 15, the result gained from the calculation of the spherical center (reference point) by applying the method of least squares to the nine coordinate values observed in 1999 survey by the “indirect method” showed evidently that the reference point was appropriate at all observation stations.

Table 15 Results of the calculation of the spherical center using the method of least squares

| Observation station | Maximum value of the residual (mm) | | | Standard deviation of the spherical center (mm) | | |
|---------------------|------------------------------------|-----|-----|---|-----------------|-----------------|
| | X | Y | H | SD _x | SD _y | SD _H |
| Koganei | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 |
| Kashima | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Miura | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Tateyama | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 |

* X,Y respectively represent the south-north and east-west component of the plane Cartesian coordinate system. H represents the vertical component.

- 2) Table 16 shows the comparison of the coordinates of SLR telescope reference point by “indirect method” in 1999 and those by “direct method” in 1997 and 1998 respectively.

Table 16 Difference of coordinates of SLR telescope reference point obtained in 1997 and 1998 compared to that in 1999.

(unit: mm)

| Year | Koganei station | | | Kashima station | | | Miura station | | | Tateyama station | | |
|------|-----------------|------|------|-----------------|------|-----|---------------|-----|-----|------------------|-----|------|
| | N | E | U | N | E | U | N | E | U | N | E | U |
| 1997 | 0.4 | 0.4 | 1.7 | 0.2 | -0.6 | 2.1 | -0.7 | 0.2 | 5.0 | 0.2 | 2.5 | 2.0 |
| 1998 | -1.6 | -1.5 | -1.9 | 0.6 | -0.6 | 1.5 | -0.2 | 0.0 | 1.9 | -0.4 | 1.7 | -1.4 |