

## 1.9 Survey of KSP-VLBI Antenna Reference Point

### (1) Survey method

- 1) In 1999, the survey of the reference point of KSP-VLBI antenna has been conducted by setting the survey target at the point of intersection of the axes of VLBI azimuth and elevation, and measuring this target from the survey points around VLBI antenna using TS, that is by the “direct method”.
- 2) For this survey, all the survey points in each station have been linked as an overall observation network and the positioning coordinates of the VLBI antenna reference point were determined by calculating the adjustment of this three-dimensional network.

### (2) Survey results

- 1) As displayed in Table 17, the results of the three-dimensional network adjustment showed evidently that the precision of the position of the reference point of KSP-VLBI antenna in 1999 survey is satisfactory.

Table 17 Precision of the estimated position of KSP-VLBI antenna reference point by three-dimensional network adjustment.

Observation station	Standard deviation (mm)		
	SD <sub>X</sub>	SD <sub>Y</sub>	SD <sub>H</sub>
Koganei	0.4	0.4	0.3
Kashima	0.6	1.0	0.3
Miura	0.7	0.8	0.6
Tateyama	0.4	0.5	0.2

- 2) Table 18 shows the comparison of the coordinates of KSP-VLBI antenna reference point gained in 1999 survey by “indirect method” and those gained respectively in 1996, 1997 and 1998 by “direct method”.
- 3) The same “direct method” applied in the survey conducted respectively in 1996 and 1998 was also applied in 1999 survey. Whereas in 1997, this survey was conducted by “indirect method” where the survey target set near the reference point was measured by rotating the azimuth angle and elevation angle of VLBI antenna.

Table 18 Coordinate discrepancies of KSP-VLBI antenna reference point gained in 1996, 1997 and 1998. compared to that gained in 1999.

(unit: mm)

Year	Koganei			Kashima			Miura			Tateyama		
	N	E	U	N	E	U	N	E	U	N	E	U
1996	-3.4	0.5	-0.8	4.4	-3.0	0.9	-7.8	-2.1	-1.4	0.4	-0.7	-0.3
1997	-2.6	-0.2	1.0	2.4	-1.9	1.6	-4.3	-0.8	-0.2	1.0	1.2	1.7
1998	-3.2	0.7	-1.5	1.7	-0.6	-0.9	-2.3	1.0	-1.4	1.0	0.7	2.2