

1.2 Determination of the orientation and positions of station datum

1.2.1 Determination of the orientation

- 1) At each station, a baseline between the station datum point and a far away point ("azimuth marker" hereafter) is set for determination of orientation. At the two end points of baseline, a 24-hours GPS survey is held and the azimuth is determined.

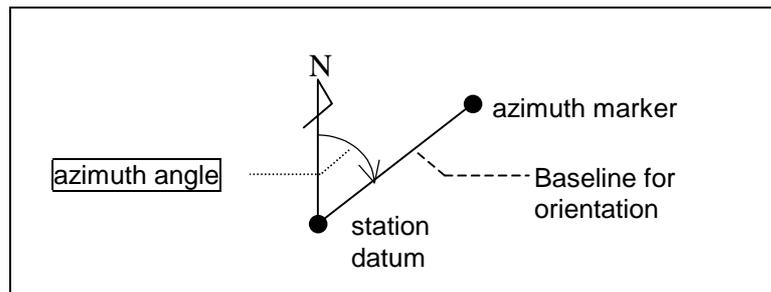


Figure 1 Determination of the orientation

- 2) Baseline for orientation is set to meet the following conditions:
 - (a) It must be long enough to keep the satisfaction of accuracy as the reference orientation.
 - (b) The two end points must be good for total station observation, that is be visible from each other.
 - (c) The two end points must be sky-opened to make sure that GPS observation is possible.
- 3) Regarding the station datum (S3) at Koganei station, however, conditions for bearing-determining base line stated above as (b) and (c) could not be met. Therefore, an alternative point (X10) has been set on the upper part of SLR observation tower as the substitute of S3.

- 4) The azimuth angle and the range of the bearing-determining base line that have been actually set in each observation station are as listed in Table 3.

Table 3 Azimuth angle and range of bearing-determining base line

Observation station	Station datum	Azimuth angle (station datum -> azimuth marker)	Range (km)
Koganei	(X10)	119 deg. 59' 41"	1.9
Kashima	S3	206 deg. 32' 25"	1.6
Miura	S3	182 deg. 01' 21"	4.3
Tateyama	L2	245 deg. 20' 23"	2.0

* X10 indicated in () is the alternative point used as the substitute of S3.

- 5) For the purpose of verifying the precision of the measurement of the bearing-determining base line, Table 4 shows the comparison of the bearing-determining base line that has been measured respectively by GPS used for direction determination and TS used for azimuth angle setting.

Table 4 Comparison of the range of bearing-determining base line measured by GPS and TS

Observation station	GPS measurement	TS measurement (TC2002)	Difference
Koganei	1905.7218 m	1905.7153 m	6.5mm
Kashima	1569.2475 m	1569.2458 m	1.7mm
Miura	4317.0768 m	4317.0679 m	8.9mm
Tateyama	2090.7171 m	2090.7162 m	0.9mm

1.2.2 Determination of the coordinates of the the station datum

- 1) At each station, the station datum's coordinates in ITRF94 frame are determined by conducting a GPS network survey in which the station datum and three GSI (Geographical Survey Institute) 's permanent GPS stations nearby are included, and performing a 3 dimensional network adjustment with the three GSI's as the fixed..

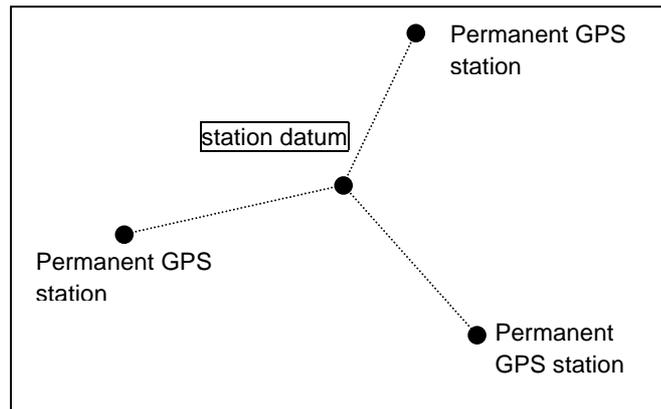


Figure 2 Station datum and electronic reference points

- 2) However, at Koganei station, the alternative point X10 is used for GPS survey, in the same way as how the reference azimuth angle was determined at this station.
- 3) As shown in Table 5, the standard deviation of the coordinates of GRS80 system of station datum that have been determined at four stations were found to be good at all the stations.

Table 5 Precision of the determined station datum

Observation station	Station datum	Standard deviation (mm)		
		SD _{latitude}	SD _{longitude}	SD _{height}
Koganei	X10	3.9	3.4	27.4
Kashima	S3	1.2	1.1	8.6
Miura	S3	2.6	2.2	18.1
Tateyama	L2	1.7	1.8	11.8