LSGI 3322 Satellite Positioning

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Field GNSS data collection and processing report: Conducting GNSS static and RTK survey on 6/F Terrace, Block ZN

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Abstract

A GNSS static survey and RTK survey was conducted at the selected point (the Point) at PolyU. The Point is located on the 6/F Terrace of Block ZN. The purpose of the survey was mainly to get familiarized with the equipment, evaluate the survey accuracy, and documenting the survey. Some other matters are also covered in this report, such as site selection and self reflection on the survey.

Introduction to GNSS

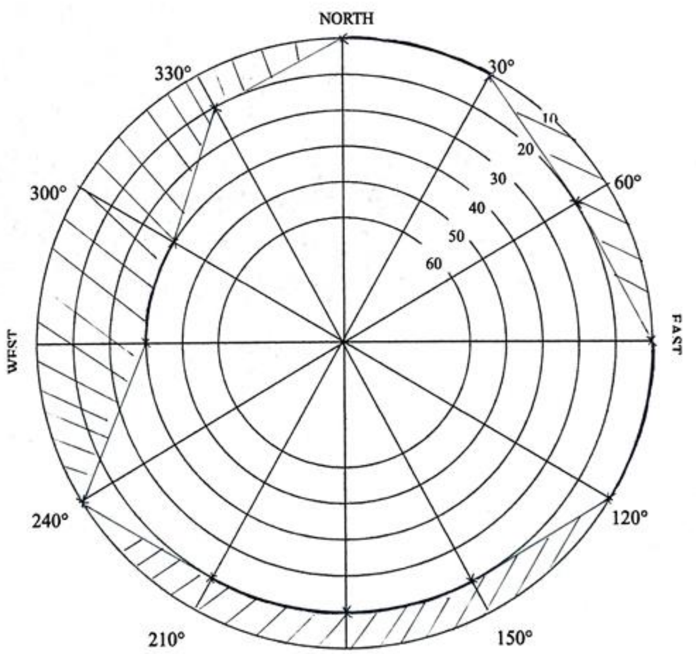
Global Navigation Satellite Systems (GNSS) are an important part in modern surveying for its versatilities. The principle of GNSS is to find the coordinates of oneself, and can be used for mapping, surveying, and construction. There are several well-known satellite systems, for instance, GPS, GLONASS, Galileo, and Beidou. To conduct the GNSS survey, there are generally two major methods, static and RTK (Real time kinematic). Static survey generally takes longer periods and yields results with high accuracy, whereas RTK survey generally takes shorter periods at the cost of some accuracy levels. Both methods require skills to operate the instruments, data processing, and evaluating the survey accuracy. This report explores both surveying methods by conducting a GNSS survey at PolyU.

Task

In this report, the requirement is to carry out static and RTK survey and process the relevant data. As mentioned in the introduction, static surveys generally take long periods of time for higher accuracy, while RTK surveys generally take less time for brief results. The data processing, survey methods, and misclosure calculations can vary greatly, thus the goals are to compare the results of static and RTK surveys, while self reflection on the surveying tasks such as accuracy, data quality, and processing efficiency.

Site location selection

The Point is located one the 6/F terrace of Block ZN. It is selected for being the most accessible to the Survey Store, which can likely reducing the potential inconveniences carrying the instruments, and reduce potential damages to the survey equipment. In addition, the site is the furthermost point from the obstruction of Block ZN. This can increase the sky window and reduce the multipath effect caused by the satellite signals bouncing off the walls of the buildings. Below shows the sky window of the Point.



It is worth mentioning that there were a few tall buildings to the west and northwest of the Point, these buildings might affect the accuracy of the surveys. Despite this, there were also many tall buildings in PolyU, this was a compromise to avoid more buildings blocking the site. Furthermore, the point is located near the control point Z003, which has known coordinates for the checking the accuracy of the Point. Overall, it appears that the selected Point is a satistfactory location for conducting GNSS surveys.

Workflow

To carry out the GNSS survey, several equipment are needed, for example, tripod, pole, GPS receiver, and handheld device. The surveying time for the static survey is around 3 hours. For the RTK surveys, take 10 points with no less than 15 seconds of interval, likely more accurate if spanning across the 3-hour duration. During the survey, it is important to ensure that the GDOP (or PDOP for RTK) does not exteed 5, and there are at least 5 satellites.
For the data processing part, a flash drive is needed to export the raw data. After unzipping the files, the antennas, SatRef stations, and observation files can be imported into Leica Geo Office. It is important to ensure the ambiguity is "yes" and passes the F-test. Finally the misclosure for SatRef stations, repeated baselines, and RTK observations can be calculated.

Survey

The survey was conducted on 19th February 2025, starting from around 9 o' clock and lasting for around 2 hours 32 minutes, at the 6/F Terrace, Block Z. The survey was originally planned for 3 hours, however, due to battery depletion, the survey ended half an hour earlier. As for the weather conditions, it was cloudy, the temperature was 15°C, and the humidity was 70%. The equipment used is Trimble GNSS reciever, tripod, pole, and handheld device. One challenge for the GNSS survey was the battery levels, and there are improvements that can be made. For example, ensure that the battery was fully charged.

Data Processing

For the data processing, it involves importing the antenna data and baseline measurements, and the softwares used were Leica Geo Office and Excel. Below shows the screenshots of measured baselines and repeated baseline differences.

Project 250219

Contents: Antennas

Name	Vertical o...	Phase center offset (vertic...	Phase center offset (vertic...	Additional correct...
AR25.R4 LEIT	0.0000	0.1583	0.1540	Elevation and azim...
STHG6SG6X-T970A N...	0.0000	0.1140	0.1148	Elevation and azim...
TRM59800.00 SCIS	0.0000	0.0865	0.1159	Elevation and azim...
TRM59800.00 SCIT	0.0000	0.0848	0.1181	Elevation and azim...
TRMR12 NONE	0.0000	0.1287	0.1168	Elevation and azim...
TRMR12I NONE	0.0000	0.1293	0.1136	Elevation and azim...

Importing the antennas

Property	Value
Reference Id	HKOH
Rover Id	HKLM
Stored Status	No
Ambiguity Status	yes
GNSS Type	GPS
Start	02/19/2025 08:59:44
End	02/19/2025 11:59:39
Duration	2h 59' 55''
Type	Static
Solution type	Phase: fix all
Frequency	Iono free (L3)
dLat	- 1' 43.42376"
dLon	- 6' 30.57422"
dHgt	-157.8332
Posn. Qlty	0.0002
Hgt. Qlty	0.0004
Posn. + Hgt. Qlty	0.0005
Slope Distance	11629.6293
Sd. Slope Distance	0.0002
Ref. Ant. Hgt.	0.0083
Rov. Ant. Hgt.	0.0083

Property	Value
Reference Id	HKST
Rover Id	HKLM
Stored Status	No
Ambiguity Status	yes
GNSS Type	GPS/GLONASS
Start	02/19/2025 08:59:44
End	02/19/2025 11:59:39
Duration	2h 59' 55''
Type	Static
Solution type	Phase: GPS fix, GLONASS float
Frequency	Iono free (L3)
dLat	-10' 34.72459"
dLon	- 3' 51.05673"
dHgt	-250.1558
Posn. Qlty	0.0002
Hgt. Qlty	0.0004
Posn. + Hgt. Qlty	0.0005
Slope Distance	20615.4303
Sd. Slope Distance	0.0002
Ref. Ant. Hgt.	0.0083
Rov. Ant. Hgt.	0.0083
Sd. Latitude	0.0002
Sd. Longitude	0.0002
Sd. Height	0.0004

Property	Value
Reference Id	HKST
Rover Id	HKOH
Stored Status	No
Ambiguity Status	yes
GNSS Type	GPS/GLONASS
Start	02/19/2025 08:59:44
End	02/19/2025 11:59:39
Duration	2h 59' 55''
Type	Static
Solution type	Phase: GPS fix, GLONASS float
Frequency	Iono free (L3)
dLat	- 8' 51.30083"
dLon	2' 39.51749"
dHgt	-92.3229
Posn. Qlty	0.0001
Hgt. Qlty	0.0003
Posn. + Hgt. Qlty	0.0003
Slope Distance	16969.0800
Sd. Slope Distance	0.0001
Ref. Ant. Hgt.	0.0083
Rov. Ant. Hgt.	0.0083
Sd. Latitude	0.0001
Sd. Longitude	0.0001

Measured baselines of the SatRef stations, showing their differences in latitude, longitude, and height.

Reference Id	Rover Id	Stored Status	Ambiguity Status	GNSS Ty...	Start	Duration	Ty...	Solution type	Frequency	dLat	dLon	dHgt	Posn.
HKLM	A	Yes	yes	GPS	02/19/2025 09:04:49	54' 50''	Static	Phase: fix all	Iono free (L3)	5' 18.07113"	3' 33.88295"	19.0505	[illegible]
HKOH	A	Yes	yes	GPS	02/19/2025 09:04:49	54' 50''	Static	Phase: fix all	Iono free (L3)	3' 34.64734"	- 2' 56.69129"	-138.7922	[illegible]
HKST	A	Yes	yes	GPS	02/19/2025 09:04:49	54' 50''	Static	Phase: fix all	Iono free (L3)	- 5' 16.65344"	-17.17384"	-231.1180	[illegible]
HKLM	A	Yes	yes	GPS	02/19/2025 09:59:44	1h 37' 45''	Static	Phase: fix all	Iono free (L3)	5' 18.07123"	3' 33.88278"	19.0453	[illegible]
HKOH	A	Yes	yes	GPS	02/19/2025 09:59:44	1h 37' 45''	Static	Phase: fix all	Iono free (L3)	3' 34.64744"	- 2' 56.69134"	-138.7814	[illegible]
HKST	A	Yes	yes	GPS	02/19/2025 09:59:44	1h 37' 45''	Static	Phase: fix all	Iono free (L3)	- 5' 16.65344"	-17.17380"	-231.1006	[illegible]

Repeated baseline differences, showing difference in latitude, longitude, and height.

Specifications

GNSS (Static) Survey

There are specifications for this GNSS survey. For the static survey, the number of satellites must be at least 5, with Geometric Dilution of Precision (GDOP) at most 5. The elevation cutoff is 15 degrees and the epoch rate should be 5 seconds.

The standard deviation in baseline measurement can be expressed in the following formula: $\sigma = \sqrt{(a^2 + (bL)^2)}$

- Where a is the base error in mm, b is the length dependent error in parts per million, and L is the Length of the GNSS baseline in kilometers. According to ESPG Class I (static), the base error (a) is 5 mm and the length dependent error is 1 ppm.

Below is a table that summarizes the base error and the length dependent error for different criteria. For this Survey ESPG Glass I (Static) is used, highlighted in yellow.

Criteria	ESPG Class I (Static)	ESPG Class II (Static / Fast Static)	COP v5
Base error (a) (mm)	5	10	10
Length dependent error (b) (ppm)	1	3	3

For control origin checking, the σ factor is 2, whereas for repeated baseline, the σ factor is 2√ 2.

GNSS (RTK) Survey

For the specifications of RTK survey, the observation time should be at 15 seconds with epoch rate of 1 second, and the Position Dilution of Precision (PDOP) is at most 5. The Position quality value is <= 0.05m and the height quality value is <= 0.1m. The tolerance for horizontal measurement is 0.03m and for vertical measurement 0.1m.

Final Adjusted Point

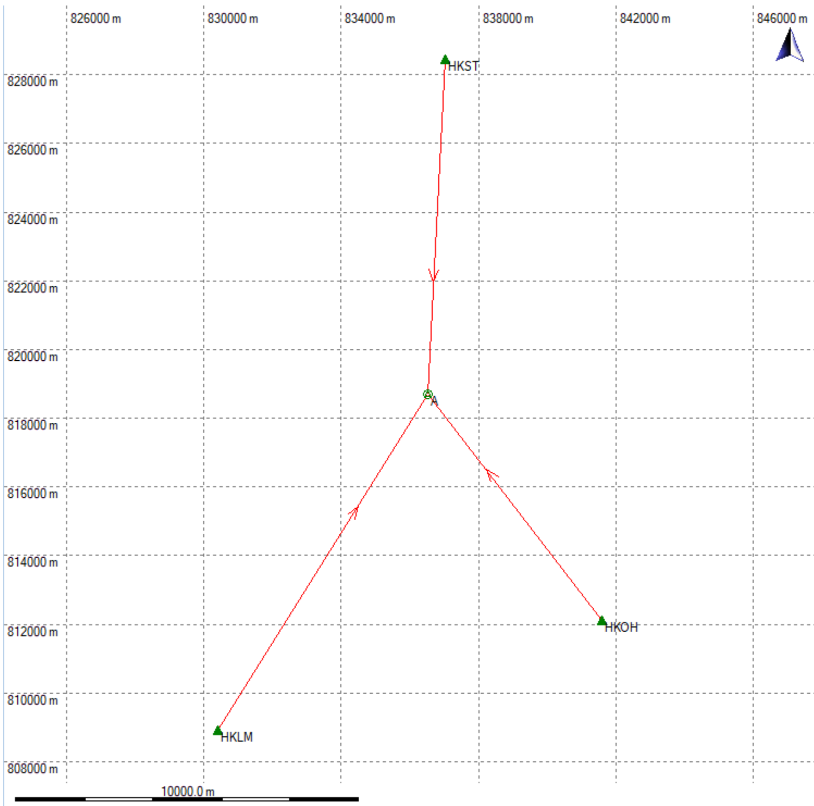
Adjustment Results

Coordinates

Station		Coordinate	Corr	Sd	
A	Latitude	22° 18' 26.32113" N	0.0000 m	0.0008 m	
	Longitude	114° 10' 46.09644" E	0.0000 m	0.0009 m	
	Height	27.6049 m	0.1990 m	0.0023 m	
HKLM	Latitude	22° 13' 08.25010" N	0.0000 m	-	fixed
	Longitude	114° 07' 12.21344" E	0.0000 m	-	fixed
	Height	8.5536 m	0.0000 m	-	fixed
HKOH	Latitude	22° 14' 51.67374" N	0.0000 m	-	fixed
	Longitude	114° 13' 42.78783" E	0.0000 m	-	fixed
	Height	166.4011 m	0.0000 m	-	fixed
HKST	Latitude	22° 23' 42.97449" N	0.0000 m	-	fixed
	Longitude	114° 11' 03.27030" E	0.0000 m	-	fixed
	Height	258.7045 m	0.0000 m	-	fixed

From the report generated by Leica Geo Office, the coordinates of Point A is 22°18’26.32113”, 114°10’46.09644”E. The standard deviation (σ) for horizontal coordinates is around 1mm, for vertical height 2.3mm. A correction of 0.199m is applied for the height, likely to compensate for the antenna height itself. (2m pole height + 0.2m receiver height = 2.2 meter total height).

I have used 3 SatRef stations to run the adjustment program: HKST (Sha Tin), HKOH (Obelisk Hill, Hong Kong Island), and HKLM (Lamma Island). As expected, the coordinates are fixed and the corrections are 0, since they are control points.



Plotted location of point (A), with repect to the 3 SatRef stations

	A	B	C	D	E	F	G	H	I
1	HKLM	Control	02/19/202	830410.2	808922.8	11.2864	-	-	0.0212
2	HKOH	Control	02/19/202	841595.1	812103.8	168.7474	-	-	0.0212
3	HKST	Control	02/19/202	837026.7	828445.6	261.607	-	-	0.0212
4	A	Adjusted	02/19/202	836535.6	818705.4	30.3076	-	-	0.0026
5									

HKLM	Control	02/19/202	22° 13' 08.	114° 07' 12	8.5536	0.0212
HKOH	Control	02/19/202	22° 14' 51.	114° 13' 42	166.4011	0.0212
HKST	Control	02/19/202	22° 23' 42.	114° 11' 03	258.7045	0.0212
A	Adjusted	02/19/202	22° 18' 26.	114° 10' 46	27.6049	0.0026

The above are generated tables of points, showing the 3 SatRef stations used and the adjusted Point in Hong Kong 1980 Grid and WGS84 Datum.

Misclosure calculations

For the calculations, I have stored the .xlsx files in the `PrecisionCalculations` folder for reference.

1. Misclosure calculations for the SatRef stations

1.1 Excel Spreadsheet

`StnAndBaselineMisclosure.xlsx > SatRefStnCheck`

	A	B	C	D	E	F	G	H	I	J	K
1			Latitude			Longitude					
2	SatRefStn	D	M	S	D	M	S		Sigma = sqrt(a^2 + (b*L)^2)		
3	HKST	22	23	42.97449	114	11	3.2703		a	5	mm
4	HKLM	22	13	8.2501	114	7	12.21344		b	1	ppm
5	HKOH	22	14	51.67374	114	13	42.78783		SatRefAcc	2	sigma
6											
7	Calculated baseline								km	sigma (mm)	
8	HKST-HKLM		-10	-34.72439		-4	8.94314		20.615	21.21	
9	HKST-HKOH		-9	8.69925		2	39.51753		16.969	17.69	
10	HKOH-HKLM		-1	-43.42364		-6	-30.57439		11.63	12.66	
11											
12	Measured baseline										
13	HKST-HKLM		-10	-34.72459		-3	-51.05673				
14	HKST-HKOH		-8	-51.30083		2	39.51749				
15	HKOH-HKLM		-1	-43.42376		-6	-30.57422				
16											
17	Absolute error										
18	HKST-HKLM			0.0002			0.00013				
19	HKST-HKOH			8E-05			4E-05				
20	HKOH-HKLM			0.00012			0.00017				
21											
22				Lat sec in mm			Long sec in mm				
23				30700			30920				
24											
25	Absolute error in mm			mm			mm				
26	HKST-HKLM			6.14			4.02				
27	HKST-HKOH			2.46			1.24				
28	HKOH-HKLM			3.68			5.26				
29											
30	Allowable misclosure		Pass?	mm		Pass?	mm				
31	HKST-HKLM		TRUE	42.43		TRUE	42.43				
32	HKST-HKOH		TRUE	35.38		TRUE	35.38				
33	HKOH-HKLM		TRUE	25.32		TRUE	25.32				
34											

Note that the degrees of the measurements are D + M / 60 + S / 3600, while some seconds are positive and some negative, causing the minute value to differ, they are still similar. For example -3 minutes and -51 seconds is equivalent to -4 minutes and +9 seconds.

1.2 Steps

1. Start with the coordinates of the original SatRef stations

2. For every pair of SatRef stations, calculate the difference in latitude and longitude.

3. The distance between the pairs of SatRef stations, the baseline is also known. For the baseline distance, calculate the sigma value (σ) using the above mentioned formula in the specifications.

4. Retrieve the measured baseline data from Leica Geo Office, which gives another set of differences in latitude and longitude.

5. Find the difference between the calculated and measured baseline latitude and longitude. The unit is in seconds. Convert seconds into millimeters. For the WGS84 Datum, one latitude second is approximately 30.7m, and one longitude second is approximately 30.92m.

6. Find the allowable misclosure of the baseline difference with the sigma value. For checking control origins, use 2σ.

7. Check if the absolute value of the differences in easting and northing are all within the allowable misclosure.

2. Misclosure calculations for repeated baselines

2.1 Excel Spreadsheet

`StnAndBaselineMisclosure.xlsx > RepeatedBaselineCheck`

	A	B	C	D	E	F	G	H	I	J	K
1			Delta Latitude			Delta Longitude					
2	**Baseline (L)**	D	M	S	D	M	S		Sigma = sqrt(a^2 + (b*L)^2)		
3	HKLM L1		5	18.07113		3	33.88295		a	5	mm
4	HKLM L2		5	18.07123		3	33.88278		b	1	ppm
5	HKOH L1		3	34.64734		-2	-56.69129		RepBLAcc	2.828427	sigma
6	HKOH L2		3	34.64744		-2	-56.69134				
7	HKST L1		-5	-16.65344		0	-17.17384				
8	HKST L2		-5	-16.65344		0	-17.17380				
9											
10	**Difference**								km	sigma	
11	HKLM			0.00010			0.00017		11.542	12.57846	
12	HKOH			0.00010			0.00005		8.319	9.705965	
13	HKST			0.00000			0.00004		9.756	10.96264	
14											
15				**Lat sec in mm**			**Long sec in mm**				
16				30700			30920				
17											
18	**Absolute error in mm**			mm			mm				
19	HKLM			3.07			5.26				
20	HKOH			3.07			1.55				
21	HKST			0.00			1.24				
22											
23	**Allowable Misclosure**		Pass?	mm		Pass?	mm				
24	HKLM		TRUE	35.57727		TRUE	35.57727				
25	HKOH		TRUE	27.45262		TRUE	27.452615				
26	HKST		TRUE	31.00704		TRUE	31.007036				

2.2 Steps

1. Retrieve two baseline data of each SatRef station from Leica Geo Office

2. Find the difference in their delta latitude and longitude. Similar to the previous calculation for control origins, convert seconds to millimeters.

3. Find the sigma value for the baseline distance, and the allowable misclosure. For checking repeated baselines, use $2\sqrt{2}\,\sigma$.

4. Check if the absolute value of the differences in easting and northing are all within the allowable misclosure.

3. Misclosure calculations for RTK observations

3.1 Excel Spreadsheet

`RTKMisclosure.xlsx > Sheet1`

	A	B	C	D	E	F	G	H	I	J	K
1	ID	E	N	H		Allowable	Misclosur				
2	static	818705.4	836535.6	30.3076		Horizonta	Vertical				
3	PRS69228!	820351.4	832591.3	23.149		30	100				
4											
5	ID	E	N	H	DiffE	DiffN	DiffHz	DiffH	Hz Pass?	Ver. Pass?	
6	rtk1	818705.4	836535.6	30.244	7.1	2.9	7.67	-63.6	TRUE	TRUE	
7	rtk2	818705.4	836535.6	30.243	6.1	1.9	6.39	-64.6	TRUE	TRUE	
8	rtk3	818705.4	836535.6	30.243	7.1	1.9	7.35	-64.6	TRUE	TRUE	
9	rtk4	818705.4	836535.6	30.242	6.1	2.9	6.75	-65.6	TRUE	TRUE	
10	rtk5	818705.4	836535.6	30.24	6.1	2.9	6.75	-67.6	TRUE	TRUE	
11	rtk6	818705.4	836535.6	30.241	5.1	2.9	5.87	-66.6	TRUE	TRUE	
12	rtk7	818705.4	836535.6	30.241	5.1	2.9	5.87	-66.6	TRUE	TRUE	
13	rtk8	818705.4	836535.6	30.242	6.1	0.9	6.17	-65.6	TRUE	TRUE	
14	rtk9	818705.4	836535.6	30.24	7.1	0.9	7.16	-67.6	TRUE	TRUE	
15	rtk10	818705.4	836535.6	30.235	5.1	-0.1	5.10	-72.6	TRUE	TRUE	
16											

3.2 Steps

1. A CSV file have been generated for RTK measurements.

2. Retrieve the adjusted coordinates of the Point from Leica Geo Office.

3. For each RTK observations, find the difference in easting, northing, and height between observation and the adjusted Point.

4. Find horizontal distance difference by applying distance formula for easting and northing.

5. For RTK measurements, the allowable misclosure for horizontal distance is **0.03m** and for vertical distance is **0.1m**.

6. Check if all the absolute value of differences is within the respective allowable misclosure.

4. Results of Misclosures

From the calculations, the absolute errors in the static and RTK surveys were within the tolerances according to the specifications.

For SatRef stations in the static survey, the shortest baseline was HKOH-HKLM, and the 2σ range is 25.32mm, and all the errors were within this value, even for the largest absolute error were only 6.14mm. The repeated baselines have also shown similar results, the shortest baseline was HKOH, and the $2\sqrt{2}\,\sigma$ range was 27.45mm. All absolute errors have passed, with the largest error being 5.26mm.

As for the RTK survey, the allowable misclosure for horizontal and vertical measurements were 30mm (0.03m) and 100mm (0.1m) respectively. The largest absolute errors for horizontal and vertical measurements were 7.67mm and 72.6mm respectively, also passing the tolerances.

Findings in the Survey

There are multiple findings in the survey, this report explores the measurement accuracy, differences in static and RTK surveys, and key factors affecting the observations.

Firstly, this survey have shown greater accuracy in the horizontal position. According to the specifications and the measurements, the horizontal position tends to be more accurate than the vertical position. This is likely due to satellites from lower elevations can also assist resolving the horizontal position, while only satellites with higher elevations can effectively resolve the vertical position. Furthermore, the horizontal error for RTK survey was 25.6% of the tolerances, while the vertical error was 72.6% of the tolerances, showing that the horizontal position in this survey is more reliable than the vertical position, even after adjusted by the specifications.

Secondly, there are some subtle differences between static and RTK surveys. RTK surveys tends to faster than static surveys. For RTK, the waiting time between the surveys can be as short as 15 seconds, while static surveys usually take hours. The static survey tends to be more accurate, and can converge to a single point, while the RTK surveys tend to have less precise measurements and can only take the average of many measurements. Static surveys are more useful for resolving the precise location, setting up control stations, and for served for long term use. For RTK surveys are more useful in rapid, coarse surveys where time is a constraint, and able to survey for many more points than static surveys.

Thirdly, there are some key factors that could affect the observations. Time could be a factor due to the ionosphere activities. In the day, the layers like F1, F2, and sporadic E are active, and in the night, only the F layer and sporadic E are active. Thus, conducting the survey in the night might reduce the ionosphere delay. The weather could also be a factor, the water vapor in the atmosphere might cause refraction to the microwaves. To mitigate this, the 15-degree cutoff is applied since the atmospheric refraction increases as the elevation decreases. The receiver could also affect the quality of the survey. For example, different GNSS products might have different accuracies and different antenna designs. In this report, the Trimble receiver was chosen. However, the results and accuracies might differ from the ones with the South receivers. Last but not least, the site selection could also be a factor. Compared to the center of the PolyU, the 6/F Terrace has less obstruction, but still some buildings to the West, reducing the sky window. A good site for GNSS survey should have little obstruction to reduce the multipath effect and maximize the satellites received.

Conclusion

Overall, this survey has achieved the required accuracy and I have also gained hands-on experience with operating the GNSS equipment. However, there were rooms of improvement, such as managing the battery levels, trying different SatRef stations for the calculations, and taking more RTK measurements for redundancy. The survey appears to meet the requirements better in the horizontal position. Despite the vertical error was also within the tolerances, the horizontal accuracy appears to perform better, well below the tolerances. This report have also gained some insights, such as the survey accuracy, differences in static and RTK surveys, and key factors affecting the observations. Overall, in this exercise, I have gained invaluable experience and knowledge in conducting GNSS survey, data processing, and how to improve.

Self Reflection

In this survey, I have operated the GNSS equipment and processed the data. Through this hands-on experience I have learned the workflow of conducting GNSS surveys, both static and RTK. I have also faced some challenges, such as the battery issue and teamwork required. The battery for the static survey were not enough to last for the full 3 hour session and had to stop. This will be important in the future, where checking the battery level is important, and ensure that it will last for the desired duration. As a sole surveyor in the field, might be more convenient and flexible to have a group mate and work as a team. For example, the surveyor might need to go to the washroom and leave the instrument, the other person can watch the instrument. At that day it was windy and some people were also walking around, this could add to the uncertainties of knocking over the instrument. It is important to keep the people away from the instrument, and stay close and guard it. Therefore, coordinating with a team might be beneficial for the survey for enhanced safety. In addition, analyzing the misclosures have deepened my understanding of data processing procedures and error sources. I have used the Leica Geo Office to assist with the baseline and misclosure calculations, and using the excel sheet to double check the results, including SatRef stations, repeated baselines, and RTK accuracies. By reflecting on the challengs and insights in this survey, I am better prepared for GNSS surveys and tackle the similar problems in the future.

Appendix

Site photo – start of survey

Site photo – end of survey

Obstruction Diagram

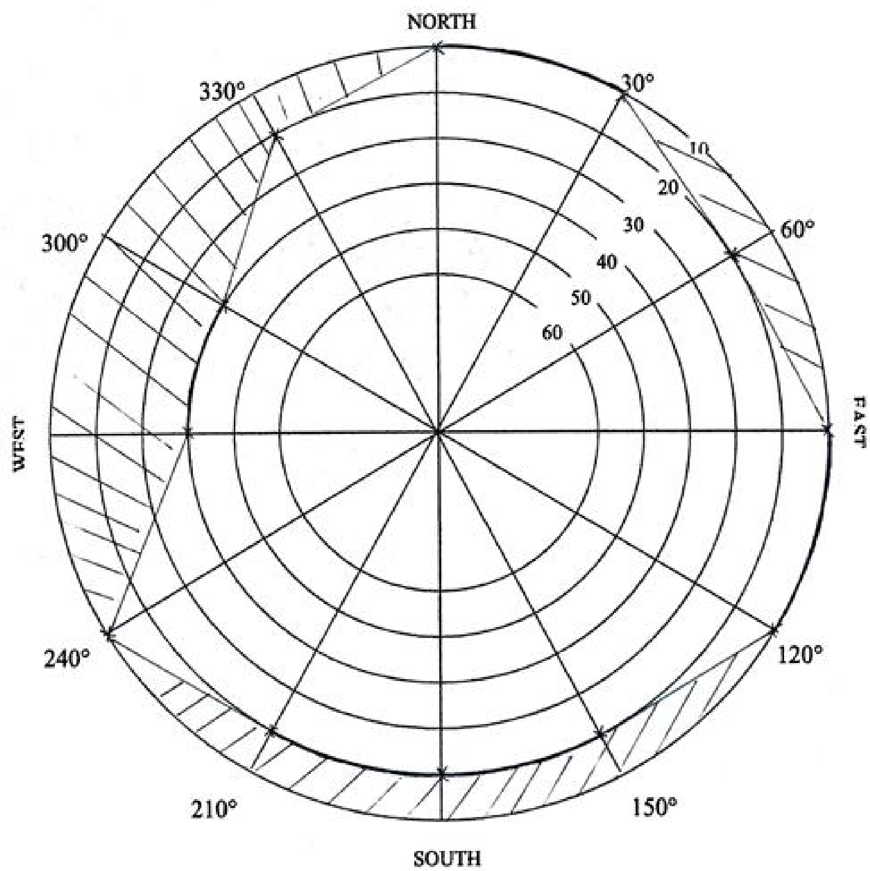
GNSS Station Horizon Obstruction Diagram

Equipment I/D: /

(for measuring elevation angle)

Station No.: A

Approximate Position: Latitude: 22°18'26" Longitude: 114°10'46" Height: 30 m



Note : Identify obstructions and shade in the relevant area on the chart above.

Do not record for elevations below 10 degrees. If there is no obscurity then indicate so.

Prepared by : [redacted] Post: [redacted] Date : 2025-2-19

Checked by : [redacted] Post : [redacted] Date : 2025-2-19

Field Sheet

Survey project / Job No. Job 001

Station Information

Station Name : A

Locality : 6/F, Block ZN, PolyU

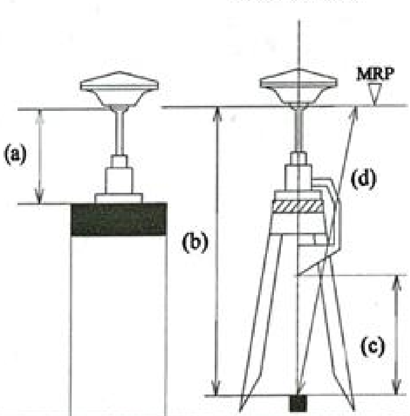
Date and Time	**Receiver Position**
Collection Rate : /	Latitude/Northing : 22° 18′ 26″
Session No. : 1	Longitude/Easting : 114° 10′ 46″
Start Day/Time (Local Time) : 09:05:05	Ellipsoidal/
End Day/Time (Local Time) : 11:37:45	Orthometric Height : 30

Instrument and Antenna Information

Receiver Model and No. : Trimble

Antenna Model and No. : Trimble

Antenna Height Measurement (Make measurements before and after observing session)



Measurement Position (Refer to diagrams and tick)

☐ (a) ☑ (b) ☐ (c) ☐ (d)

*Pocket tape/ Height Hook/ Height rod ID no.________

	BEFORE	AFTER
	2 m	2 m
	m	m
Mean (Before and After)		2 m
Other offset (please indicate on sketch)		/ m
TOTAL ANTENNA HEIGHT		2 m

*delete if not applicable MRP – Mechanical Reference Plane

Obstruction or possible interference ________

General weather conditions temperature 15°C, cloudy, humidity 70%

Operated by: [redacted]

Date: 2025-2-19

Checked by: [redacted]

Date: 2025-2-19

Folder name	Content
`FieldSheets`	Obstruction diagram and field sheet
`FinalPoint`	CSV of the final point in HK1980 and WGS84
`PrecisionCalculations`	Excel spreadsheets calculating the misclosures for SatRef stations, repeated baselines, and RTK accuracies
`RawData`	The raw files exported from the receiver
`Reports`	Reports generated by Leica Geo Office
`RTK`	Unzipped RTK measurements
`Screenshots`	Screenshots of the Leica Geo Office windows