SOUTH

# SLAM RTK DotLas Plus Showcase Test Report 2

@ Lat Phrao Wang-hin, Bangkok, Thailand

*by Jackie Cheung* *2025/03/13*

**This is test round 2 conducted in Bangkok, Thailand.**

**This time, it's intended to test Magicalc, positioning while satellites unlocked in GNSS-unfriendly and GNSS-denied areas.**

**When GNSS RTK is working indoors or say got obstructed, lack of satellite signals, is it possible to obtain positioning results still?**

# Report Guidelines

1. Definitions of Magicalc and Mixed Solution
2. Test Contents & Test Stuff
3. Test Methodology
4. Station Point & Backsight Point Measurements
5. Checkpoint Measurements
6. DotLas Plus Measurements
7. Results Comparison
8. Conclusion

# 1. Definitions of Magicalc and Mixed Solution

## Getting to Know Magicalc...


**Magicalc = Magic Calculation**

**In RTK work mode, enable SLAM for the special work status, then it's possible to obtain the positioning results in GNSS-unfriendly or even GNSS-denied areas based on SLAM trajectory reverse computation.**

## About Fixed solution & Mixed Solution

### Fixed Solution

*means that the GNSS RTK rover and its allocated base station can simultaneously track at least five satellites in common, and then the rover keeps receiving differential corrections from the base station, which is already widely acknowledged in the geospatial community.*


### Mixed Solution

*refers to a reverse computed result scientifically derived from the time synchronization of SLAM trajectory and earlier positional records, which well interprets the Mix&Match Combo. By unlocking the combined power of GNSS+SLAM, it sets out* ***A Brand New Concept to the Industry*** *indeed.*

# 2. Test Contents & Test Stuff

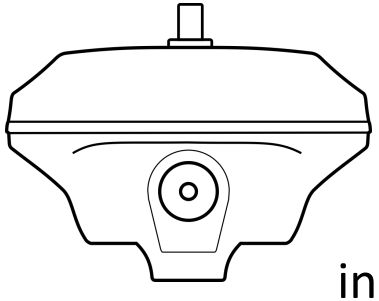


In test round 1, DotLas Plus was successfully proved to obtain positioning results, known as **Mixed Solutions**, when conventional GNSS RTK models could not (as shown left). Yet, it's needed to verify the accuracy performance of such positioning results. So, in test round 2, let's see how this new breakthrough helps to challenge GNSS-unfriendly or even GNSS-denied areas.

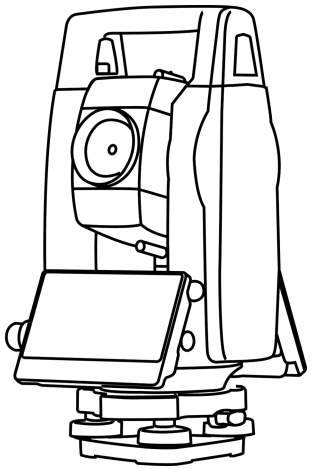
Test Stuff:

a. SLAM RTK DotLas Plus
b. South Total Station N40
c. Android smartphone (to go with DotLas Plus)
d. fieldwork software SurvStar
e. point cloud process software RobotSLAM Engine
f. prism set
g. prism pole + prism
h. tripod for prism set and total station one each
i. 3 sim cards (AIS, DTAC and TRUE one each)
j. local CORS access info

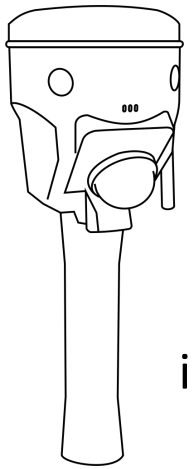
# 3. Test Methodology



indoor



indoor



indoor

When conventional GNSS RTK fails to obtain coordinates indoors, it's inferred to deploy Total Station and collect some checkpoints for verification. It always makes sense to verify the results from lately-introduced equipment according to those from the highly-recognized old instruments.
Just take DotLas Plus to the same locations, then measure, compare, and check the deviations.

# 4. Station Point & Backsight Point Measurements

1) DotLas Plus to connect local CORS, and obtain the first coordinate as backsight point

2) set up prism set with tribrach and tripod for this backsight point

Note: if time is allowed, it's better to adopt static GPS survey to obtain the coordinates of station point and backsight point.

3) obtain another coordinate for station point with reasonable intervisibility to different directions

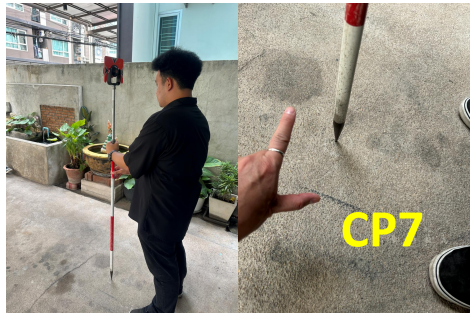
4) set up total station, and input station point and backsight point coordinates, instrument height and prism height

# 5. Checkpoint Measurements (CP1 - CP10)



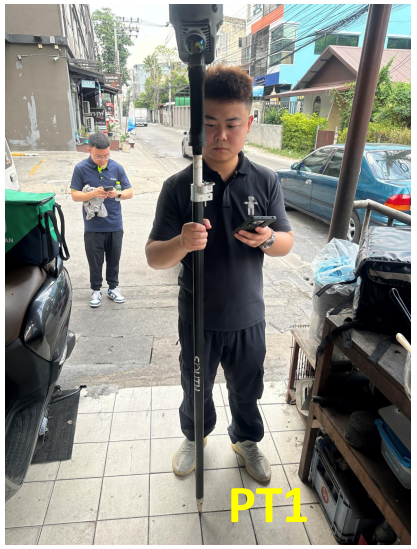






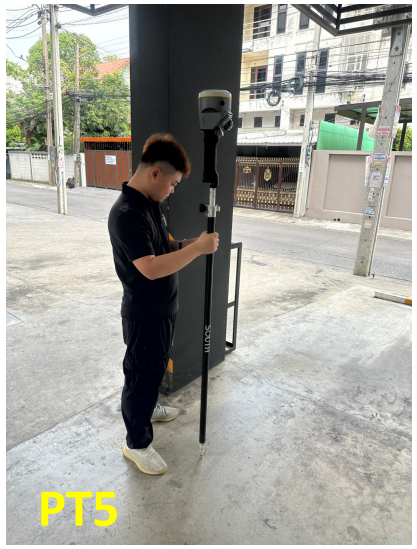


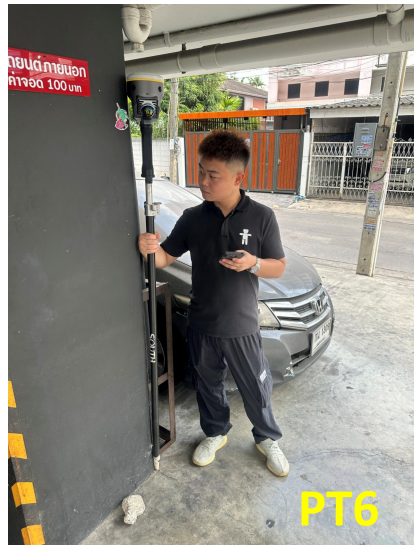

# 6. DotLas Plus Measurements (PT1 - PT10)










6 points outside office (1 under ground floor shelter, other 5 inside car park area)

4 points inside office (from car park space to ground floor corridor)




# 7. Results Comparison in General

| | X | Y | Z | | X | Y | Z | | dX | dY | dZ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Measured by DotLas Plus (used in regular RTK mode)** | | | | | | | | | | | |
| Backsight Point | 672235.867 | 1528249.536 | -29.773 | | | | | | | | |
| Station Point | 672216.139 | 1528254.628 | -29.808 | | | | | | | | |
| | | | | | | | | | | | |
| **Measured by Total Station N40** | | | | **Measured by DotLas Plus (with merged application Magicalc)** | | | | | **Deviation** | | |
| CP1 | 672245.501 | 1528250.608 | -29.725 | PT1 | 672245.611 | 1528250.621 | -29.651 | | 0.11 | 0.013 | 0.074 |
| CP2 | 672211.512 | 1528242.900 | -29.512 | PT2 | 672211.572 | 1528242.822 | -29.419 | | 0.06 | -0.078 | 0.093 |
| CP3 | 672205.952 | 1528236.370 | -29.402 | PT3 | 672206.035 | 1528236.359 | -29.412 | | 0.083 | -0.011 | -0.01 |
| CP4 | 672200.469 | 1528234.461 | -29.455 | PT4 | 672200.425 | 1528234.427 | -29.415 | | -0.044 | -0.034 | 0.04 |
| CP5 | 672199.460 | 1528240.675 | -29.478 | PT5 | 672199.433 | 1528240.636 | -29.427 | | -0.027 | -0.039 | 0.051 |
| CP6 | 672188.297 | 1528240.403 | -29.251 | PT6 | 672188.562 | 1528240.266 | -29.413 | | 0.265 | -0.137 | -0.162 |
| CP7 | 672215.538 | 1528262.364 | -29.267 | PT7 | 672215.568 | 1528262.361 | -29.311 | | 0.03 | -0.003 | -0.044 |
| CP8 | 672214.747 | 1528265.994 | -29.254 | PT8 | 672214.812 | 1528266.022 | -29.318 | | 0.065 | 0.028 | -0.064 |
| CP9 | 672214.12 | 1528270.546 | -29.15 | PT9 | 672214.122 | 1528270.542 | -29.238 | | 0.002 | -0.004 | -0.088 |
| CP10 | 672213.617 | 1528274.605 | -29.195 | PT10 | 672213.652 | 1528274.632 | -29.233 | | 0.035 | 0.027 | -0.038 |

**Except PT1 and PT6, all other 8 points enjoyed centimeter-level deviations as expected, in other words, below 10 cm.**

**Check details in the coming slides to see WHY the values of PT1 and PT6 exceeded 10 cm.**

# 7. Results Comparison in Details

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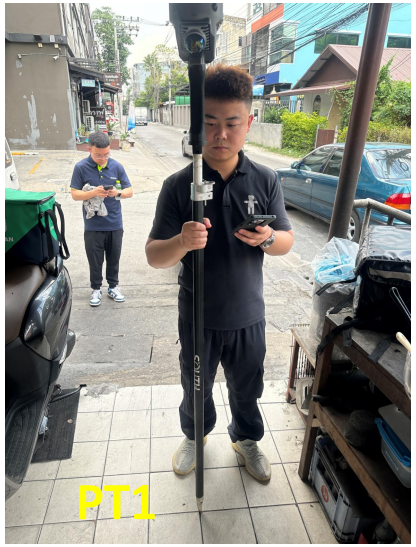




DotLas Plus was in between Fixed and Mixed at that moment. And it was hard to say whether the RTK fixed was true or not. So, this location was not an ideal one for testing and comparison.

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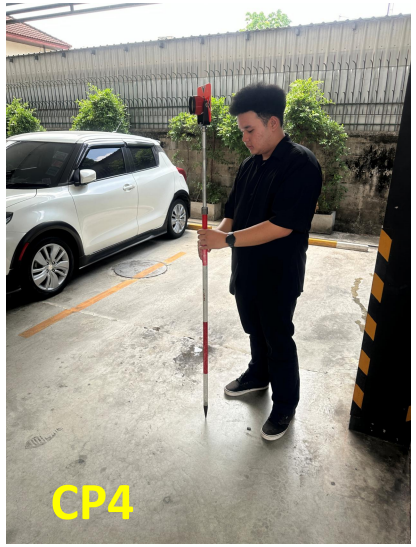


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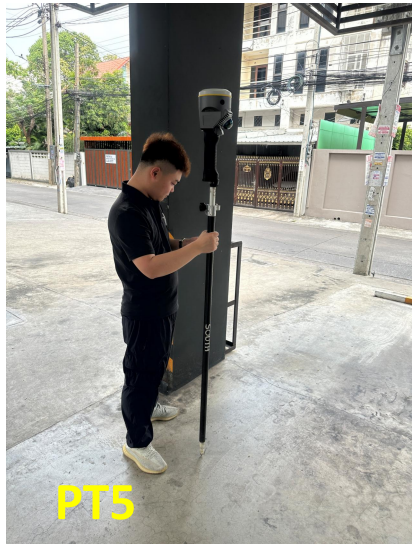



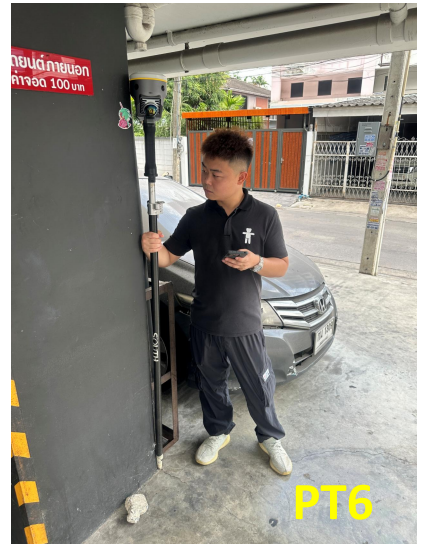


Tilt survey has not yet applied to merged applications, so the deviation is relatively bigger than all others. Soon it would be done, then deviation might be controlled down to centimeter level.

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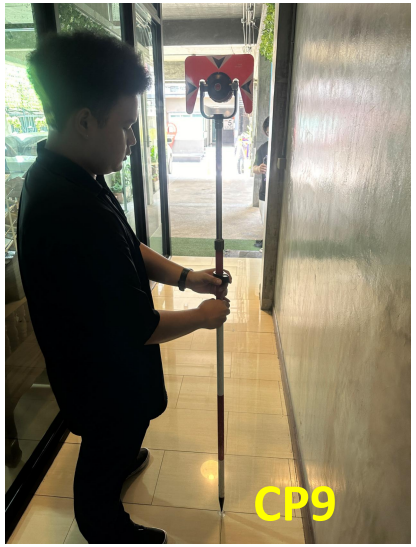




## 8. Conclusion

What makes DotLas Plus outstanding is the merged applications.

In this mission, Magicalc was further tested and achieved centimeter-level accuracy, typically below 10 cm, in other words, it's possible to rely on DotLas Plus positioning data in GNSS-unfriendly and GNSS-denied areas.

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# Summary:

## 1+1 > 2 is true.