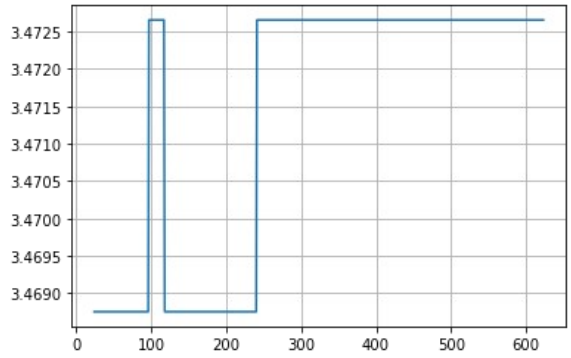
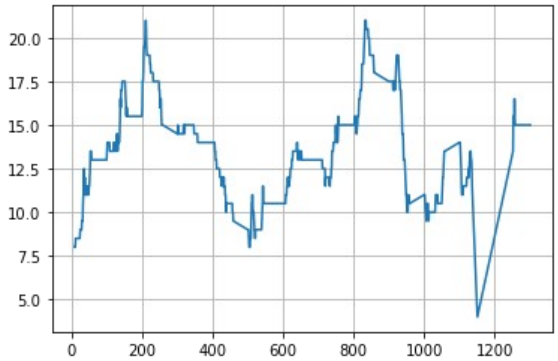
LAB2 Analysis

**Stationary data without occlusion**

Analysis on Northing

For better comparison lets start with Northing of both stationary datas from the RTK GPS and the normal GPS

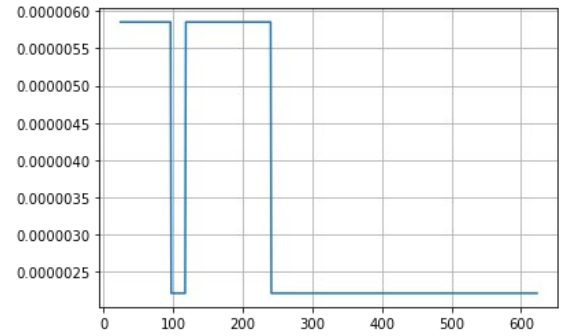



On comparing the two graphs you can see how the stationary data for the gps goes all over the place but the rtk gps mostly remains constant throughtout or has very little deviation due to the corrections received from the station.

Now it makes sense to find the mean of this data as the data doesnt change as dramatically and it linearizes after a point

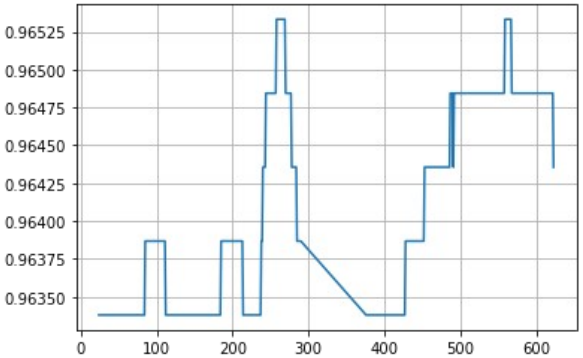
Mean squared error distribution:

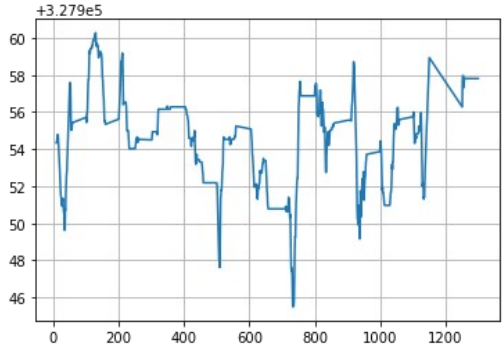



***Standard deviation:0.001898445953817723***

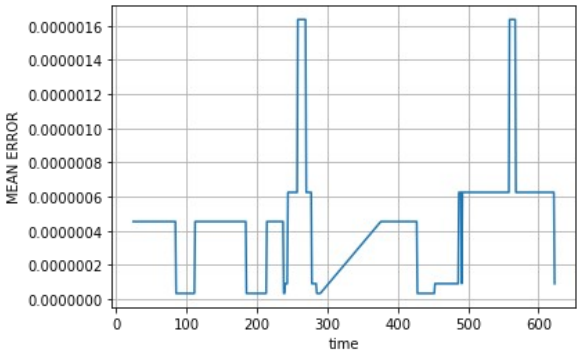
This tells us that the precision of the rtk gps is good upto ***0.0043 meters***, and the precision of the normal gps is good upto ***18.7 meters***. Thus the RTK GPS can be used for higher levels of accuracy, this accuracy is attributed by the corrections made by the reference station

Analysis on Easting



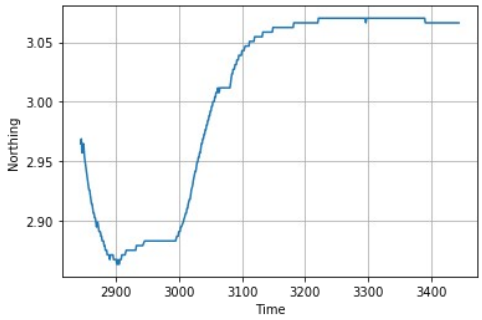



The easting however is not as uniform as we wanted but it still gives us good accuracy of upto 3 decimal points which is almost ***0.001 m***. But here it is important to compare how much our data is better than what we received for LAB1 where we received a range of values over ***16 metres***.
MSE:



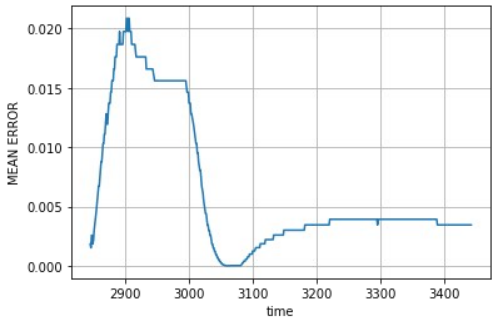

A very nice observation here could be to check the units of both MSEs here(northing and easting), the easting has a smaller error distribution range than northing.
However, this graph doesnt add much value to the analysis as the mean constantly changes through the time period, hence there is no definite mean. Just for the sake of visualization I have received the ***mean*** as
***0.96875+6693 m***
***Standard deviation:0.0006684872403936656***

**Stationary data with occlusion**
Analysis on Northing



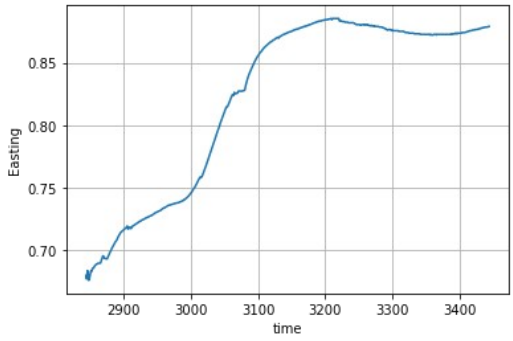

The graph kind of linearizes after a period of time so it makes sense to find the error on this plot. However, most of the data is not uniform which should be the case in of stationary data, which leads us to conclude that occlusions do take part in determining the quality of data that we receive.

MSE:



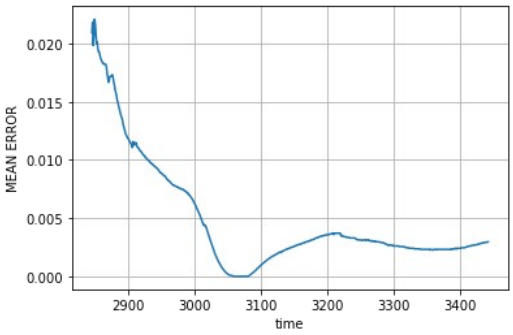
This graph shows that there’s a lot of error in the start of data collection but as time increases the error reduces to a minimum

Analysis on Easting




This graph also shares the similar pattern with the northing but it is much smoother comparatively.

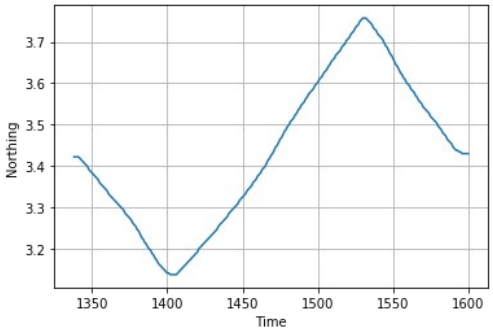
MSE:




Follow similar pattern with northing which might make us conclude that the RTK GPS needs time to stabilize and give the correct output.

**Walking data without occlusion**

Analysis on northing



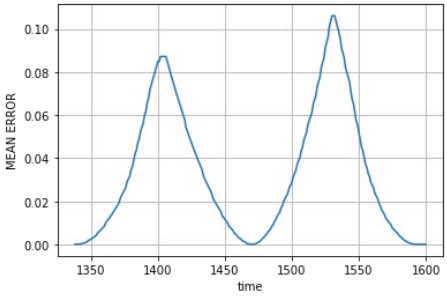

Gotta love this graph, so smooth and clearly depicts that you're walking in a closed path,returning back to the start point. Since it is also symmetric we can find the graphs for errors for analysis. NOTE:
The error analysis graphs are just for visualization of data and to prove the symmetric nature of this graph, not for actual error calculation

***Final northing – start northing :0.0078125***

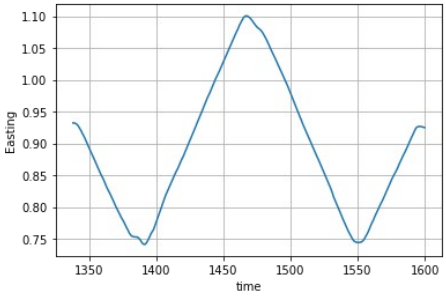
On walking in a closed loop it shows that the difference between the start and end point is this value, ideally this value should be 0, but yeah even this works.

***Total mean error should be 0 is -7.930793799459934e-10***
Due to the pattern of our path, the mean should exactly be the middle point of the data and the mean error should then be 0, the value of this is really really small which tells us that the accuracy of this device is really great.

MSE:




Although this graph doesnt tell us anything about the mean error it tells us that the second peak is a little bigger than the first peak in the northing graph, which might tell us that there might be some ambiguity between the turning. As in the path might not be exactly perfect or it might be a possible error.
<u>Analysis on easting</u>

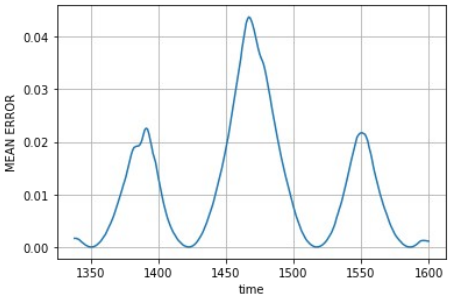



This graph is also almost symmetrical except for the end points or the turning points in the path. During the walking stage the data is really smooth and impeccable but has very slight errors during the turning, this also happened for the northing graph which might make me say that this device works best when a person is traversing through a distance

***Final easting – start easting:0.00732421875***
This value should be 0 but still holds good accountability

***Total mean error should be 0, but is 2.637534635141492e-11***
The mean error is even less than northing and we can say that this graph is more symmetrical than the northing graph.

<u>MSE</u>*:*

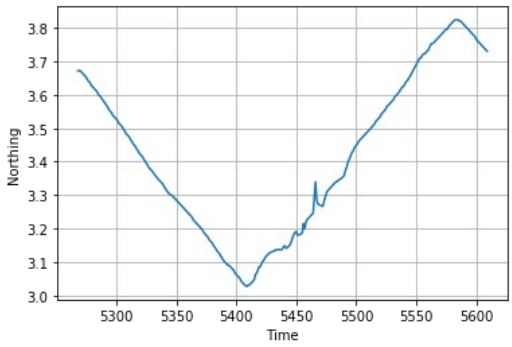


Again, this graph doesnt tell us  much about the error unless we know the exact points of path, this  does tells us that the path that we took was symmetrical

**Walking data with occlusion**

*A rectangular path*

Analysis on northing



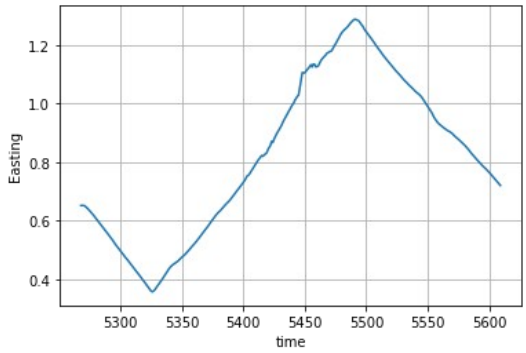

***Final northing – start northing: 0.08984375***

There is slight difference between the start and end point, this means that either the path was incomplete or the GPS gave us errors due to the certainty of occlusions, as compared to the previous data, this data is not as uniformly distributed.

**Total mean error: -1.0477378964424133e-09**

Though the graph is not distributed perfectly the mean error might tell us a little about the distribution of data rather than the error.

Analysis on easting




***Final easting – start easting: 0.431640625***

The presence of occlusions gives us this error here

**Total mean error:  0**

An absolutely fantastic statistic here is that the total distance traveled to the east is same as west which should tell us that the path we walked on was a perfect rectangle. Although,the northing statistic doesnt match this, this is very ideal data plot.

Overall comments:

The presence of occlusion gives us erroneous data at some plots. In this report I have specifically only taken the fixed data value (5) for my analysis. The distribution of errors and the quality of data we received is significantly better than LAB1. To make this device run, from my observation, it should be given sufficient time to stabilize and then after a point it starts spitting out data which is most probably accurate. The answer to all questions are given throughout this report. Thanks!