



## Considerations for NeQuick G speed optimization

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With the ongoing deployment of the Galileo constellation, reaching the Final Orbit Constellation (FOC) configuration, the study of the NeQuick G model is paramount for understanding the performance of this model worldwide. As it is well known, the NeQuick G is based on the NeQuick model, see [1], which is a 3D electron density profiler. This model does not use a mapping function. Instead, it integrates the electron density along the Line of Sight to get the final STEC value for each receiver to satellite link.

In this study, new sets of general model optimizations have been tested in order to increase the execution speed of the model. These optimizations range from changes in the model itself and storing pre-computed parameters in look-up-tables to changing the integration routine parameters. Since NeQuick G is mainly a navigation ionospheric model, the requirements for the optimization have been related to its main application. In this sense, two types of uses have been selected: The High accuracy users, with RMS errors below 2 TECU and the Low accuracy users, with errors below 5% of the original NeQuick G STEC. These two types of uses are trying to cover the main target of the NeQuick G. Applying these conditions leads to speed gain around 10 times over the original execution time.

In this study the performance of the NeQuick G and different versions of the Optimised NeQuick G will be presented for the period from January 2017 to December 2017. Not only typical statistical analysis will be considered, but studies with all possible input values to ensure that the conditions for high and low accuracy users are fulfilled. Moreover, the overbounding errors of the optimized versions will be presented.

1. Hochegger, G., Nava, B., Radicella, S.M. and Leitinger, R. (2000), "A family of ionospheric models for different uses", Phys. Chem. Earth (C). Vol. 25, No. 4, pp. 295-299, 2000