



Second order propagation delay effects in regional precise positioning

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With the increasing number of precise navigation and positioning applications by using Global Navigation Satellite Systems (GNSS) such as GPS, the ionospheric higher order effects and their correction become more and more important. Whereas the first-order error is usually eliminated by a linear combination of dual frequency measurements, the second- and third-order residual effects remain uncorrected in this approach.

We discuss the effect of second order range errors as a function of the total electron content of the ionosphere and geomagnetic-geographic relationships for mid-European (Germany) users. Applying the corrections, the rest error can be reduced to the 2 mm level at a high vertical TEC level of 10^{18} el/m² (100 TECU). Possibilities are discussed how second order refraction effects may be performed in precise positioning networks.