Accounting for the influences of 2nd order ionospheric terms on VLBI measurements

M. Hawarey, T. Hobiger, **H. Schuh**

Institute of Geodesy and Geophysics, Vienna University of Technology, Vienna, Austria
(harald.schuh@tuwien.ac.at / Fax: +43-1-58801-12896 / Phone: +43-58801-12860)

The current state-of-the-art VLBI software packages take into account ionospheric terms of 1st order only. This research study investigated the effects of 2nd order terms on VLBI measurements. The mathematical algorithm used follows the general framework presented in Kedar et al. (2003) for the case of GPS. However, the approximation of the Earth's magnetic field and the assumption of a 400km high ionospheric shell stated there are avoided in this work by using the IGRF (i.e. International Geomagnetic Reference Field) and PIM (i.e. Parameterized Ionospheric Model) to calculate the geomagnetic field vectors and electron densities at 100 representative points along the incoming ray paths. The effects calculated here are at the level of 1-2picoseconds and were introduced to VLBI databases to be processed by the VLBI software OC-CAM. The results revealed a maximum difference between global baseline lengths with and without 2nd order ionospheric terms equivalent to 0.5 mm as seen on 19th of October, 2002 for the baseline Kokee Park (Hawaii, USA) to Wettzell (Germany). These effects may be considered negligible at the time being, but certainly will become a topic of interest within the next 10 years as the international space geodesy is aiming at the sub-millimeter accuracy of global baselines.