

## **Abstract**

**24th European Frequency and Time Forum; 13-16 April 2010, Noordwijk, The Netherlands**

### **Evaluation of GIOVE Satellite Clocks using the CONGO Network**

U. Hugentobler<sup>1)</sup>, P. Steigenberger<sup>1)</sup>, O. Montenbruck<sup>2)</sup>, A. Hauschild<sup>2)</sup>, G. Weber<sup>3)</sup>, U. Hessels<sup>3)</sup>

<sup>1)</sup> Institute for Astronomical and Physical Geodesy, Technische Universität München, Munich, Germany

<sup>2)</sup> German Space Operations Center (GSOC), German Aerospace Center (DLR), Oberpfaffenhofen, Germany

<sup>3)</sup> Federal Agency for Cartography and Geodesy (BKG), Frankfurt a. M., Germany

GIOVE B was launched on April 26, 2008, and carries a passive hydrogen maser, the most stable clock ever flown in space until today. Since mid 2009, both GIOVE-A and GIOVE-B are continuously tracked by the a global network of real-time GNSS monitoring stations established jointly by the German Aerospace Agency (DLR) and the German Federal Agency for Cartography and Geodesy (BKG). The COoperative Network for GIOVE Observation (CONGO) presently comprises 10 stations and provides an almost complete dual-site coverage. All tracking data are transmitted in real-time and archived at Technische Universität München (TUM), Munich, for further processing. The various CONGO stations employ different types of receivers and antennas but can, as a minimum track all visible GPS and GIOVE satellites in the L1/L2 and E1/E5 bands, respectively. The global coverage and multi-constellation capability of the CONGO network enable an independent determination of precise orbits and clock products for the two Galileo test satellites. The presentation describes the CONGO network and the approach to GIOVE orbit and clock determination pursued at TUM. In particular, new concepts for the modeling and estimation of high precision space clocks are discussed and illustrated with data from the CONGO network. The results contribute to an improved in-flight characterization the GIOVE B hydrogen maser and confirm its excellent quality over a wide range of time scales.