

Length in geodesy

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Finnish Geospatial Research Institute, FGI

The Finnish Geospatial Research Institute, FGI, of the National Land Survey of Finland maintains measurement standards for geodetic and photogrammetric measurements and is the National Standards Laboratory of acceleration of free fall and length. The FGI takes care of the fundamental measurements in Finnish cartography and of geographical information metrology and carries out scientific research in geodesy, geographic information sciences, positioning, navigation, photogrammetry and remote sensing.

Calibration services

The FGI calibrates high precision electronic distance measurement (EDM) instruments, geodetic baselines and photogrammetric test fields. Moreover, we calibrate precise levelling rods, digital and traditional, and system calibration of digital level instruments. The calibrations are performed in addition to the Masala laboratories at Nummela Standard Baseline and at Metsähovi Fundamental station. Most of our work is carried out in field conditions or conditions analogous to operating situations.

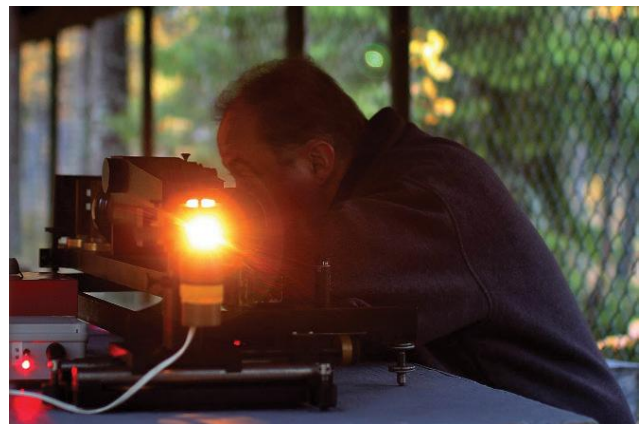


Figure 1 and 2. The Nummela standard baseline measured by using the Vaisälä comparator has been one of the most accurate and stable lengths over the past half decade.



Traceability and uncertainty

National measurement standards for length at the FGI are a Väisälä interference comparator with a quartz meter system and a levelling rod comparator system with a laser interferometer. All the measurements are traceable with a known uncertainty. Baselines (864 m and 432 m) measured with the Väisälä interference comparator have typically a measurement uncertainty ranging from 0.1 ppm to 0.2 ppm ($k=2$) and the measurement uncertainty for other baselines (1 m - 10 km) is at its best 0.2 ppm. The measurement uncertainty for calibration of levelling rods is 1 ppm and 5 ppm for calibration of levelling systems.

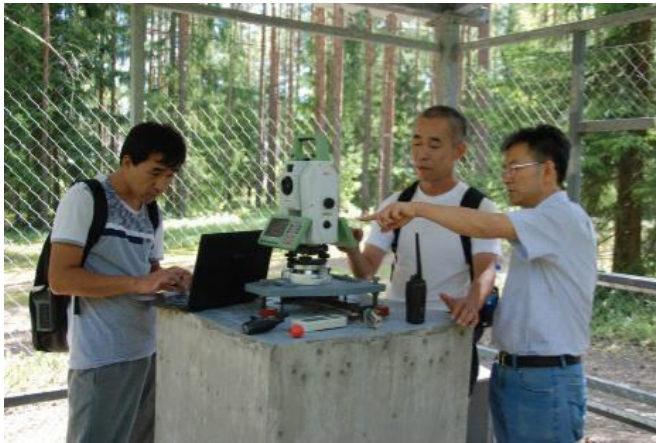


Figure 3. Calibration of the most accurate distance meters of the world can be done at the Nummela Standard Baseline. Nummela scale has been transferred also to several foreign baselines.

Research and development

The FGI carries out research and development on methods and equipment for the measurements for geodesy and geospatial information science. In addition to length measurements, we perform other precision measurement in surveying, e.g. measurements of angle, azimuths, determination of coordinates and satellite positioning. We also participate in GNSS metrology related projects. International cooperation is a central part of our work and we have measured baselines in about 20 countries.



Figure 4. Calibration of a digital precise level instrument and system calibration of a barcode rod.



Figure 5. Research on the accuracy of GNSS antennas can be made at the test field of the Metsähovi observatory.