

## The European GeoMetre project – developing enhanced large-scale dimensional metrology for geodesy

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### ABSTRACT

We provide a survey on the joint European research project “GeoMetre”, which explores novel technologies and their inclusion to existing surveying strategies to improve the traceability of geodetic reference frames to the SI definition of the metre. This work includes the development of novel distance meters with a range of up to 5 km, the realisation of optical multilateration systems for large structure monitoring at an operation distance of 50 m and beyond, and a novel strategy for GNSS-based distance determination. Different methods for refractivity compensation, based on classical sensors, on dispersion, on spectroscopic thermometry and on the speed of sound to reduce the meteorological uncertainties in precise distance measurements are developed

further and characterised. These systems are validated at and applied to the novel European standard baseline EURO5000 at the Pieniny Kippen Belt, Poland, which was completely refurbished and intensely studied in this project. We use our novel instruments for a reduced uncertainty of the scale in the surveillance networks solutions for local tie measurements at space-geodetic co-location stations. We also investigate novel approaches like close-range photogrammetry to reference point determination of space-geodetic telescopes. Finally, we also investigate the inclusion of the local gravity field to consider the deviations of the vertical in the data analysis and to reduce the uncertainty of coordinate transformations in this complex problem.

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