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ABSTRACT

The NPL instrument to correct for angular refraction in geodesy measures the small dispersion between images of red (633 nm) and blue (442 nm) laser sources formed by a telescope. It uses a rotating chopper disc in association with an optical compensator plate and a phase null meter. The instrument and some early field tests have been described in detail elsewhere (Williams, D.C., 1978).

Absolute tests of the prototype have recently been made over a 4 km suburban range at an average height of 30 m. The apparent elevation of the red laser was observed with a T3 theodolite and corrected for refraction, the laser and theodolite being referred to local bench marks with a known height difference determined by spirit levelling.

On an occasion in late May 1978, the effects of turbulence were particularly small. The refraction-corrected theodolite readings then agreed with the expected value to within one sexagesimal second. Other results obtained during the preceding two months indicate that increasing turbulence causes the dispersion angle to appear too large, the greatest error observed being about 3 seconds of refraction. It is thought that most of the turbulence was due to effluent from chimneys, and that the apparent error may be due to an instrumental effect which has not yet been identified.

The performance of the instrument has also been evaluated on a 20 km range near Uppsala during the present Symposium, by kind invitation of Prof. E. Tengström. The principal difference from the 4 km range was that the intensity scintillations of the red and blue signals were no longer correlated when the refraction was large. Independent compensation of red and blue signals for this effect should enable good results to be obtained over this distance.

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REFERENCES

Williams, D.C.: 1978, "First field tests of an angular dual wavelength instrument", Proc. of the International Symposium on Electromagnetic Distance Measurement and the Influence of Atmospheric Refraction, Netherlands Geodetic Commission, pp. 163-170.