

New desktop goniopolarimeter at FGI and joint measurement efforts

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After hundreds of reflectance measurements with Finnish Geodetic Institute's Field Goniospectrometer (FIGIFIGO) [1], we are complementing our facility with a more precise desktop goniopolarimeter. Field use requires many compromises that can be relaxed in laboratory, and some things are done in different way just to experiment and validate.

The new system is build around a central axis, where the spectrometer shelf, zenith arm, and sample tray on top are connected. It further differs from the old one by the main sensor ASD Field Spec 4 SR, 350–2500 nm (vs. Field Spec Pro FR), broad band wire grid polariser (vs. Glan-Thomas calcite prism), smaller field of view of 5 cm in diameter (vs. 20 cm), shorter arm length of 50–100 cm (vs. 150–250 cm), fully automatic movement (vs. manual azimuth). We further use a smaller 250 W QTH light source from Oriel (vs. 1000 W), with a beam width of 20 cm (vs. 60 cm), polarised using another wire grid (vs. unpolarised), three-lens setup (vs. two mirrors).

First measurements agree within 5% with the FIGIFIGO and confirm there are no fundamental flaws in either design. The new system has better polarisation accuracy, but the reflectance accuracy maybe even less, because of smaller signal after all the optics.

We are working together between FGI, UH, PKU, NENU, and BNU to cross-validate the polarisation accuracy and to design measurement and illumination mechanics and optics further. We will present new results of sand, snow, dirt, and dirty snow. We compare the measurements against models developed in Finland, China, and elsewhere.

Reference

- [1] Peltoniemi, J. I., T. Hakala, J. Suomalainen, E. Honkavaara, L. Markelin, M. Gritsevich, J. Eskelinen, P. Jaanson, and E. Ikonen, 2014: A detailed study for the provision of measurement uncertainty and traceability for goniospectrometers. *J. Quant. Spectrosc. Radiat. Transfer* **146**, 376–390.

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