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Research on hydrostatic leveling system to provide elevation constraints for control network adjustment

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As the precise sensor system for monitoring the rela-tive altitude changes among multiple points, the capacity hydrostatic leveling system (HLS) is widely used in particle accelerators. To expand its application in provid-ing the elevation constraint for the control network ad-justment, the research on the issue of the HLS for alti-tude difference measurement between multiple points is carried out. Based on the working principle of the HLS sensor, a comparison system composed of dual-frequency laser interferometer, high-precision Z stage, HLS sensors and others is designed and manufactured. The system is used to control multiple sensors to observe the same liquid level in the same coordinate system. The zero-position difference among sensors can be obtained by comparison. Then the altitude difference measure-ment can be realized, and it is verified that the measure-ment accuracy is better than 5 μm. In addition, a simula-tion experiment for 3D control network measurement is run, in which the HLS system provides the elevation constraint for the adjustment processing. The results show that for the 100m linear tunnel, the errors accumu-lation in the elevation direction is significantly improved compared to the classics adjustment.

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Footnotes

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