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Research on the alignment methods for the super-long beamlines at SSRF

Three super-long beamlines will be built at SSRF. These beamlines' core parts are usually distributed in several large and isolated spaces, it's necessary to guarantee the alignment precision in the whole range. In other words, the continuous precision of 3D control network in the whole range must be ensured. To reach this purpose, the transferring station precision is studied at first. By changing the layout of control network and adding some more constraints between transferring stations, to study the change of 3D control network precision, constraints usually are reference meters. Besides, a theodolite and a digital levelling instrument are used to evaluate and calibrate the rough error of 3D control network. The theodolite has a high precision angle measurement performance. Its measuring process is affected less by the circumstance outdoors. Two theodolites can form a triangular net, which can be used to measure long distance control network and maintain measuring precision. The digital levelling instrument can be used to obtain elevation deviation directly and applied as elevation reference for 3D control network. Based on these methods, a reliable method can be used for ensuring the continuous precision of 3D control network in the large and complex spaces.

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