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

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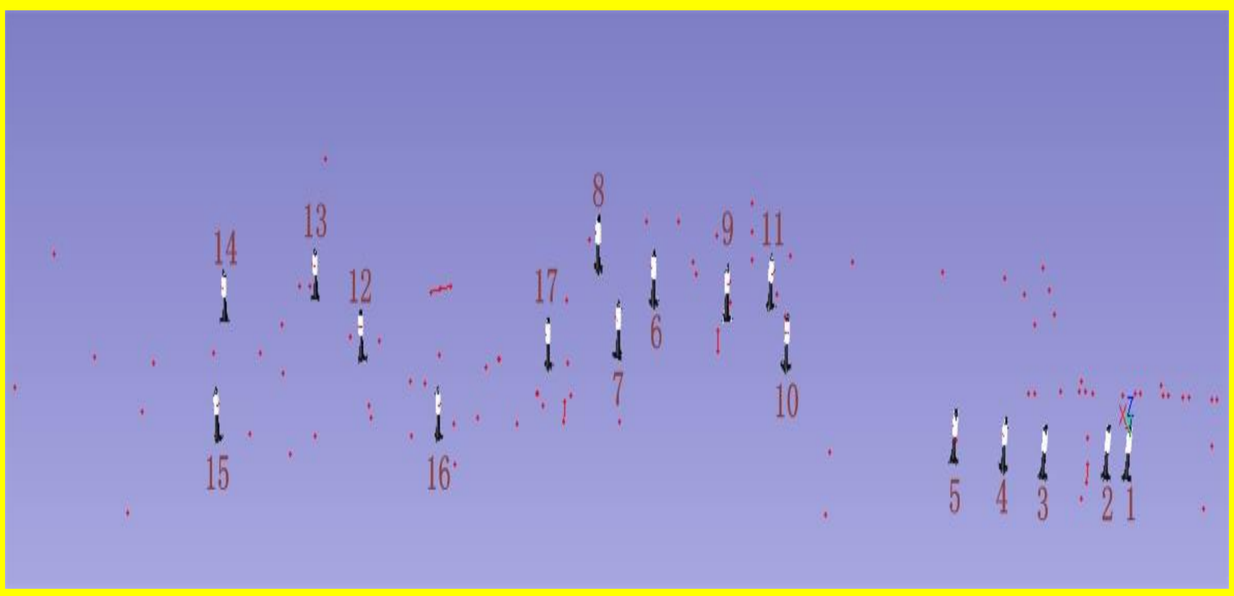
Three super-long beamlines will be built at SSRF, which will across storage ring, experimental hall and beamline office, the lab will be built outdoors, the longest beamline is up to 130m. The beamlines' core parts are usually distributed in several large and isolated spaces, so it's necessary to guarantee the alignment precision in whole range. As the commonly used alignment method, 3D control network points will be distributed in every isolated spaces, the continuous precision of 3D control network in whole range must be ensured. Laser tracker is the main measuring instrument. Besides, some auxiliary methods and instruments are planned to be used.



Laser tracker's transfer station measurement precision is crucial for the continuous precision of 3D control network. Through some experiments, changing the layout of control network and adding some reference constraints among transfer stations to improve the continuous precision. Reference constraints usually are reference meters.

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. Some completed experiments show that the measurement deviation between two theodolite and laser tracker is less than 0.1mm.

The digital levelling instrument can be used to obtain the elevation deviation directly and be used as elevation reference for 3D control network points in different isolated spaces.

Based on these auxiliary methods, a reliable scheme can be used for ensuring the continuous precision of 3D control network. The alignment deviation expectation from storage ring to lab is less than 0.4mm