

Alignment Strategy for HALF and Some Research Process on Alignment Technologies at NSRL

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Hefei Advanced Light Facility (HALF), a key mega-science facility, has started civil construction since June 2023 in Hefei, China, and National Synchrotron Radiation Laboratory (NSRL) is responsible for the construction. HALF is a 4th generation diffraction limited synchrotron radiation light source which includes a 192 m injector, a 138.4 m transport line, and a storage ring with a circumference of 480 m. Comparing to the 3rd and earlier generation light source, it requires more stringent alignment accuracy. This paper instructs the alignment strategy for it, including alignment accuracy requirements for different parts, alignment procedures and techniques for different stages of the project from civil engineering, the installation of components in the machine to the deformation monitoring system. At the same time, this paper elaborates on the scientific research work aimed at improving accuracy and efficiency in each sub stage of control network establishment, pre-alignment stage, smoothing and other alignment stages, such as automation simulation and measurement methods of control network based on measurement plan, four laser tracker pre-alignment system and its accuracy improvement algorithms, comparison of multiple self-developed smoothing methods, control network deformation prediction algorithm with machine learning. The above scientific research will be further deepened in the future to further assist in the alignment work of HALF and other large scientific devices.

Author: HE, Xiaoye (National Synchrotron Radiation Laboratory)

Co-authors: WU, Enchen (National Synchrotron Radiation Laboratory); ZHANG, Qiuyu (National Synchrotron Radiation Laboratory); DING, Ting (National Synchrotron Radiation Laboratory); WANG, Wei (National Synchrotron Radiation Laboratory)

Presenter: HE, Xiaoye (National Synchrotron Radiation Laboratory)

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