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Alignment and Measurement of SSC-Linac RFQ

The first high-charge, heavy-charge, continuous-wave four-bar RFQ (Radio Frequency Quadrupolec) accelerator jointly developed by the Institute of Modern Physics of the Chinese Academy of Sciences and the Institute of Heavy Ion Physics, Peking University is the first of its kind in the Institute of Modern Physics, Chinese Academy of Sciences. The injector of the ion linear accelerator is designed to operate at a frequency of 53.667 MHz, an implantation energy of 3.728 keV·u−1, an output energy of 143 keV·u−1, a mass/charge ratio of 3–7, and a length of 2.5 m. Its machinery manufacturing process and welding tolerance requirements are extremely high, and whether its processing accuracy can meet the requirements is a key indicator of whether RFQ can be successfully delivered. The measurement problem of the mechanical workpiece shape and position error occupies an important position in the machinery manufacturing industry, especially the shape error of a large workpiece directly determines its work performance. The traditional part-shaped position error detection usually uses calipers, squares, height scales and other measurement tools, and there has been a lack of complete and feasible methods and means for on-site detection of large-scale parts shape and position errors. The laser tracker and measuring arm provide the possibility of applying the “measurement coordinate value principle” to achieve on-line detection of workpiece machining error with its portability, accuracy, reliability and ease of operation. In the assembly position detection, in order to complete the RFQ mechanical position tolerance measurement, we used the combination of laser tracker and joint measuring arm to measure the two tasks to complete the inspection task.

Summary

SSC-Linac RFQ (Separated Sector Cyclotron Linac Radio Frequency Quadrupolec) is the first high-charge, strong-current, heavy ion continuous wave four-bar accelerator jointly developed by the Institute of Modern Physics of the Chinese Academy of Sciences and Peking University. The precision of machining is RFQ. One of the key steps to successful delivery. In order to detect the mechanical position tolerances, a new measurement method using a reasonable combination of a laser tracker and a joint measuring arm is adopted, so that the two high-precision measuring instruments can overcome the shortcomings and overcome the shortcomings of the traditional measurement methods for large-scale workpiece shape tolerances. To make it work in the measurement process to its optimal use and operability, effectively improve the work efficiency, thus ensuring RFQ high-precision measurement results.

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