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Design of the dimensional metrology and alignment scheme for the 1/32 CFETR VV Mock-up

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Abstract: The vacuum vessel (VV) of Chinese Fusion Engineering Testing Reactor (CFETR) is a D-shape, double-layer and toroidal structure, which have a high precision requirement, a large-size and too weight, the challenge can be foreseen in the VV manufacturing. As an important control means of the quality, the hyperboloid surface of VV should be inspected to ensure qualified manufacture such as heat form, weld and machine, however the inspection of the hyperboloid surface and assembly alignment are difficult issues. In this paper, a scheme of three-dimensional (3D) metrology and alignment was proposed, which were welding the special nests of fiducial on VV, using Laser Tracker to measure the surface of VV, computing and fitting the measurement points to designed model, getting the best fit and the average errors by setting the weight of points and changing the calculation model, then calibrate and value the fiducials which can be using in after manufacture and assembly as the datum. The scheme of 3D metrology solve the difficult issues of the inspection of the hyperboloid surface and assembly alignment during in 1/32 CFETR VV Mock-up manufacturing which was completed by ASIPP.
Keyword: Inspection of the hyperboloid surface, Assembly alignment, Best fit, Laser Track.

Eligible for student paper award?

No

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