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Alignment of LIPAc, the IFMIF prototype high current deuteron accelerator: requirements and current status

IFMIF, presently in its Engineering Validation and Engineering Design Activities (EVEDA) phase, aims at running a 9 MeV / 125 mA / CW deuteron accelerator in Rokkasho (Japan) to validate IFMIF's 40 MeV / 125 mA / CW accelerator with components mainly designed and constructed in European labs. Beam dynamics calculations demand accuracies and precisions of alignment for certain components within ± 0.1 mm in an assembly hall of 7x35m to keep beam losses below defined thresholds and allow future hands-on maintenance activities. Simulations with the original Global Coordinate Frame (GCF) carried out with Spatial Analyzer® predicted uncertainties in the measurements above the target alignment accuracies. Thus, an upgrade of the original fiducial network was undertaken with the installation of 120 new fiducials and a survey pillar; whose simulations predicted feasible uncertainties of the measurement within x5 of the target accuracies. The survey campaigns carried out with the additional extensive fiducials network installed in the accelerator hall correlated nicely with the simulations. Recent observations indicate possible movement of certain fiducials beyond the thermal displacements driven by temperature gradients along the year. An assessment of the impact on the GCF and the uncertainties on the measurements on both fiducials displacements due to potential building settling effects and temperature variations in the accelerator hall is here provided.

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