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P2.003 Final design of the JT-60SA pellet launching system for simultaneous density and ELM control

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The key mission of the new tokamak JT-60SA is to conduct exploitations in view of ITER and to resolve key physics and engineering issues for DEMO. Its pellet launching system was designed to cover according requirements by providing a powerful and flexible tool for the control of density profile and ELM frequency. Therefore, the systems lay out had to be adapted for pellet injection via a guiding tube with an already pre-set geometry from the vessel inboard side. Modelling showed inboard launch is a must in order to achieve high fuelling efficiency; by analysing the potential pellet fuelling impact in all relevant plasma scenarios the optimized set of pellet parameters for fulfilling all the tasks requirements was elaborated. The feasibility of a mechanical centrifuge as pellet acceleration unit was studied. This approach would guarantee the precise pellet launch speed as needed to enable the best adaptation to the guiding tube transfer capabilities and accurate control of pellet frequency and particle flux as arriving in the plasma. While the appropriateness of the centrifuge principle has been already proven by several devices, the proposed version possesses a novel design employing several accelerator arms. Such, operation at heighten rates and with a more refined adjustment of pellet flux and frequency could be achieved. Moreover, it allows hosting several sources delivering different pellets and their simultaneous actuation. The appropriate control unit is designed to merge pellets from different sources and form a sequence for the simultaneous control of different basic plasma parameters as e.g. density and ELM frequency. This flexibility can also allow including additional applications like isotope fraction control or radiative power exhaust by the use of compound pellets. At present, the detailed engineering of all major components is in progress, aiming to provide specifications and get ready to prepare the procurement process.

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