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Beam dynamics studies for the definition of the MEBT-3 beam line section (MYRRHA)

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As part of the MYRRHA project, an accelerator-driven system demonstrator (ADS) will be built for transmutation of long-lived nuclear waste in a sub-critical reactor with a thermal power of 100 MW. A high current (4 mA) proton beam at 600 MeV will be provided by a linear accelerator with a very high reliability necessary for extending the life of the reactor and minimizing unplanned shut-downs.

The latter goals will be facilitated by using two identical beam lines extending from the ion sources, the low energy beam lines and the injectors and providing a proton beam accelerated to 17 MeV. The two lines will be merged inside the medium energy beam line section (MEBT-3) using dipoles and a fast switching magnet. Additionally, two sub-sections with beam dumps capable of receiving proton beams of 70 kW power will be installed after the dipoles. The non-accelerating MEBT-3 line includes also transverse and longitudinal beam focusing elements (23 quadrupoles and 4 superconducting cavities), a collimation system and various diagnostics. The design of this section aims at maximal beam transmission, good beam definition (emittance and matching) and double achromaticity after the switching magnet. The details of the latest beam dynamics studies for the MEBT-3 design are going to be presented.

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