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Study of Composite Materials for Aisha Containment Chamber

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Abstract : The ion sources for accelerators devoted to medical applications must provide intense ion beams, with high reproducibility, stability and brightness. AISHa (Advanced Ion Source for Hadron-therapy) is a compact ECRIS whose hybrid magnetic system consists of a permanent Halbach-type hexapole magnet and a set of independently energized superconducting coils. These coils will be enclosed in a compact cryostat with two cryocoolers for LHe-free operation. The AISHa ion source has been designed by taking into account the typical requirements of hospital-based facilities, where the minimization of the mean time between failures (MTBF) is a key point together with the maintenance operations which should be fast and easy. It is intended to be a multipurpose device, operating at 18 GHz, in order to achieve higher plasma densities. It should provide enough versatility for future needs of the hadron therapy, including the ability to run at larger microwave power to produce different species and highly charged ion beams. The source is potentially interesting for any hadrontherapy center using heavy ions. In the paper, we designed an innovative solution for the plasma containment chamber that allows us to solve our isolation and structural problems. We analyzed the materials chosen for our aim (glass fibers and carbon fibers) and we illustrated the all process (spinning, curing and machining) of the assembly of our chamber. The glass fibers and carbon fibers are used to reinforce polymer matrices and give rise to structural composites and composites by molding.

Keywords : hadron-therapy, carbon fiber, glass fiber, vacuum-bag, ECR, ion source
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