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## **Thu-Af-Or23-08: A Design Study on No-Insulation HTS Isochronous Cyclotron Magnet for Carbon Ion Therapy**

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Provided that a cyclotron system requires DC magnetic field, the no-insulation (NI) HTS magnet may be a good candidate as it may enable the cyclotron magnet to be more compact and reliable, yet generate a substantially higher magnetic field than its insulated counterpart. Here we report on a design study of a NI HTS cyclotron magnet for acceleration of carbon ions under isochronous condition up to an energy of  $\sim 400\text{MeV/u}$ . For beam stability, HTS coils having a designated field profile with the so-called “hill” and “valley” structure is proposed. After the initial design is completed, the proposed cyclotron magnet is analyzed using a 3D finite element method. This paper presents the magnet design and performance analysis results that include: (1) electromagnetic design of radially increasing magnetic field, a.k.a isochronous magnetic field; (2) charging-discharging scenarios; (3) mechanical stress analysis with potential use of an overband; and (4) post-quench behavior of the NI HTS coils.

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