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IBA S2C2: The influence of first harmonic field errors on the beam quality

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The S2C2 is the new compact proton-therapy accelerator for the IBA ProteusOne range of products. It is the first synchrocyclotron as well as the first superconducting cyclotron ever produced at IBA.
In this communication a study is made of the deteriorating effect of a first harmonic field error due to the □r=1 resonance in the S2C2, thereby taking into account the acceleration process. It is shown that in the main part of the accelerating region this deteriorating effect is almost non-existing. This is due to the very slow acceleration used in the S2C2. The beam centroid adiabatically follows the magnetic center of the machine and no coherent oscillations are generated. Only the central region and the extraction region require special care in terms of the shimming of the first harmonic error. For the intermediate region the shimming requirement is less strict and can be determined by setting an upper limit for the allowable shift of the magnetic center with respect to the geometrical center.
For the purpose of the study, a new tracking program was developed that numerically integrates the equations of orbit center motion in a cyclotron.

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poster

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