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Phase_motion: a program for the study of the longitudinal beam optics in a synchrocyclotron

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During the development of a synchrocyclotron the RF-frequency and voltage behavior during the pulse must be specified. The efficiency of capturing injected ions into the RF-bucket and also the stability of the RF bucket size during the acceleration depend on this. It is possible to study these processes with a full 3-D tracking code but such calculations are complex and time-consuming.

The goal of the current study is to develop a simplified tracking code where only the longitudinal motion is calculated. The central region is decoupled from the longitudinal effects and is considered as a 'filter' which excludes certain ranges of RF phase which will in practice be lost horizontally or vertically during the first few turns. This is an approximation, but it serves as a helpful and fast additional design guideline for study of the RF-frequency and voltage curves and it also allows calculating the particle during the full acceleration cycle.

The program integrates the equations of longitudinal motion (the phase-equations) in a synchrocyclotron assuming that the properties synchronous particle are known. The problem of capture in the S2C2 is studied as an example.

Please indicate preferred presentation (poster or talk?)

poster

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