



Simulations kick 10 Hz

Simple example of a particle kicked with a sinusoidal function

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Introduction

Goal of this study: Study a particle experiencing a 10 Hz sinusoidal kick to see how the phase changes

- as a first step, import the lhc lattice (thin lens) using xtrack
- switch off octopoles - linear machine
- Import the monitors (BPMs) in this case all of them meaning DOROS too!

Create an exciter

- using `xtrack.Exciter(...)` one can set the needed excitation and specify the starting turn, its duration and its form
- for our purpose a sine function is used with 10 Hz frequency
- then we track the particle (with zero horizontal and vertical displacement). The longitudinal direction is also frozen!
- tracking for 1000 turns (goal 10 000 turns)

Twiss parameters

- we make use of the twiss parameters - `line.twiss()`
- the phase advance can be called as `twiss[:, 'bpms'].mux`
- we use the horizontal displacement in normalized coordinates - $x_{\text{norm}} = x / \sqrt{\beta}$
- we make use of the restored symmetry when going to the normalized trace space

Plot the phase advance

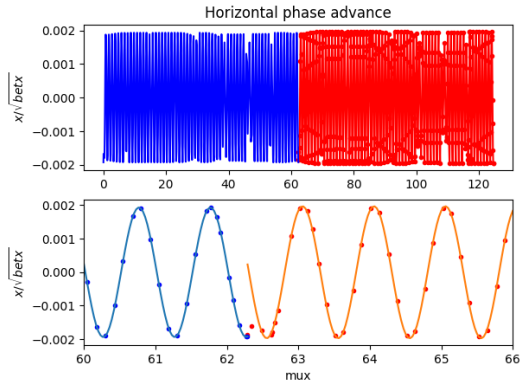


Figure: The broken phase is visible since we apply a kick and break the symmetry. For two turns, the kick is applied always in the beginning of the turn.

Kick where we compute the phase

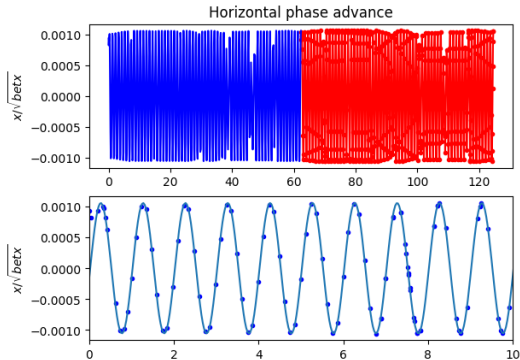


Figure: At the beginning of the turn we observe a discontinuity

Unwrapped phase

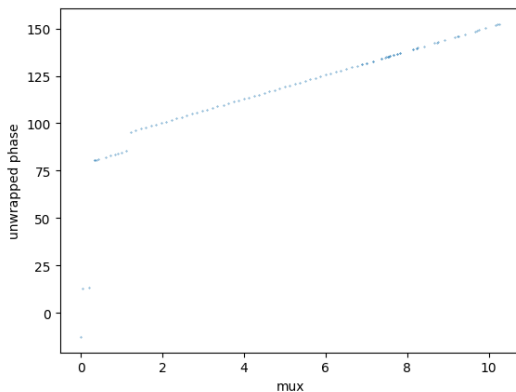


Figure: Unwrapped phase jump

Conclusion

- a simple tracking code with a kick is build
- the phase advance is investigated
- an approach to detect the breaking of the phase is being developed using the unwrapped phase
- To do: need for inclusion of all the complexity we expect
- more debugging is needed: why do we see this second jump in the unwrapped phase



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