Weekly Meeting

Aug. 24th, 2018

Overview:

We can assume the map can be represented by a Lie transformation and factorized as

$$\mathrm{M} = Re^{:f_3:}e^{:f_4:}\cdots$$

To simplify this map, i.e., separate the contribution from different orders, we can construct a map M3

$$U = e^{:F_3:}Me^{:-F_3:}$$

Where F3 is a generator that removes resonance driving terms from $e^{:f_3:}$

The f_i's are polynomials of i^{th} order (in phase space coord.)

These f_i's can be written as:

$$f_{jklm} = \frac{h_{jklm}}{1 - e^{i2\pi[(j-k)\nu_x + (l-m)\nu_y]}}$$

$$F = \sum_{jklm} f_{jklm}\varsigma_x^+\varsigma_x^-\varsigma_y^+\varsigma_y^- = F_3 + F_4 + \cdots$$

Where F is a generator constructed from the RDT's (h_{jklm}) which give the Fourier coefficients f_i's of the eigenvectors of the rotation operator.

Overview:

RDT's are lattice dependent:

$$h_{jklm} = c\sum_{i=1}^{N} S_2 \beta_{xi}^{(j+k)/2} \beta_{yi}^{(l+m)/2} e^{i[(j-k)\mu_{xi}+(l-m)\mu_{yi}]}$$

The plan:

1) Construct a RDT for a given, simple lattice.
2) Construct the map
3) Track the map and study the phase space

The problem: this is a lot harder than I originally thought…

1) Hard to know if the method is right because this hasn't been done before..

Solution: Do this procedure for a simple sextupole lattice, then a simple octopole lattice?

Progress

- (See Mathematica)

"Ideas"

- Can we skip the "going backwards" part of this? (Go straight into understanding which RDTs contribute the most to DA minimizations)
- Stas' question: During optimization, how do optimizers/the people doing the opt. avoid/ address $\{h_{jklm}\} = 0$ solutions?

Help

- Mike: Have you personally calculated the RDT's (analytically) for a sextupole?
- Jim: If I want to start constructing a Jacobian…
  - Concerns about linearly dependent RDTs
  - Concerns about rank

Synopsis of Meeting:

- Keep going! Keep working on building the machinery for "going backwards"
- Use/find any resources to help create this machinery:
  - http://physics.indiana.edu/~shylee/p571/Jing_Yichao/nonlinear.pdf
  - http://pcwww.liv.ac.uk/~awolski/Teaching/Cockcroft/NonlinearDynamics/NonlinearDynamics-Part7-Handout.pdf