Comment on number of passes in RLAs

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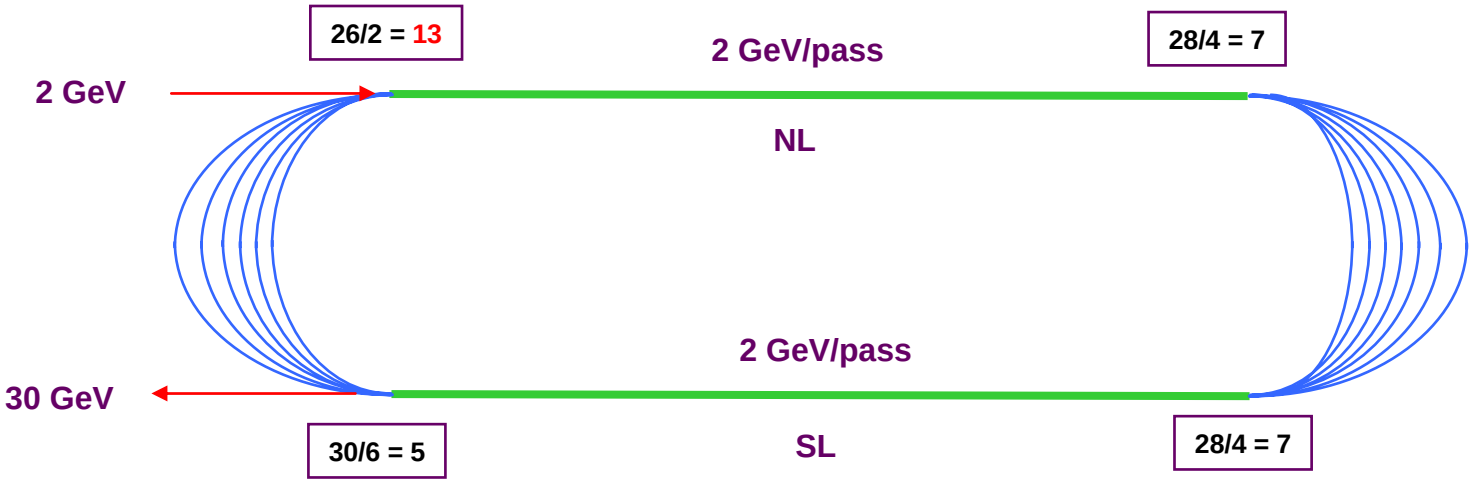
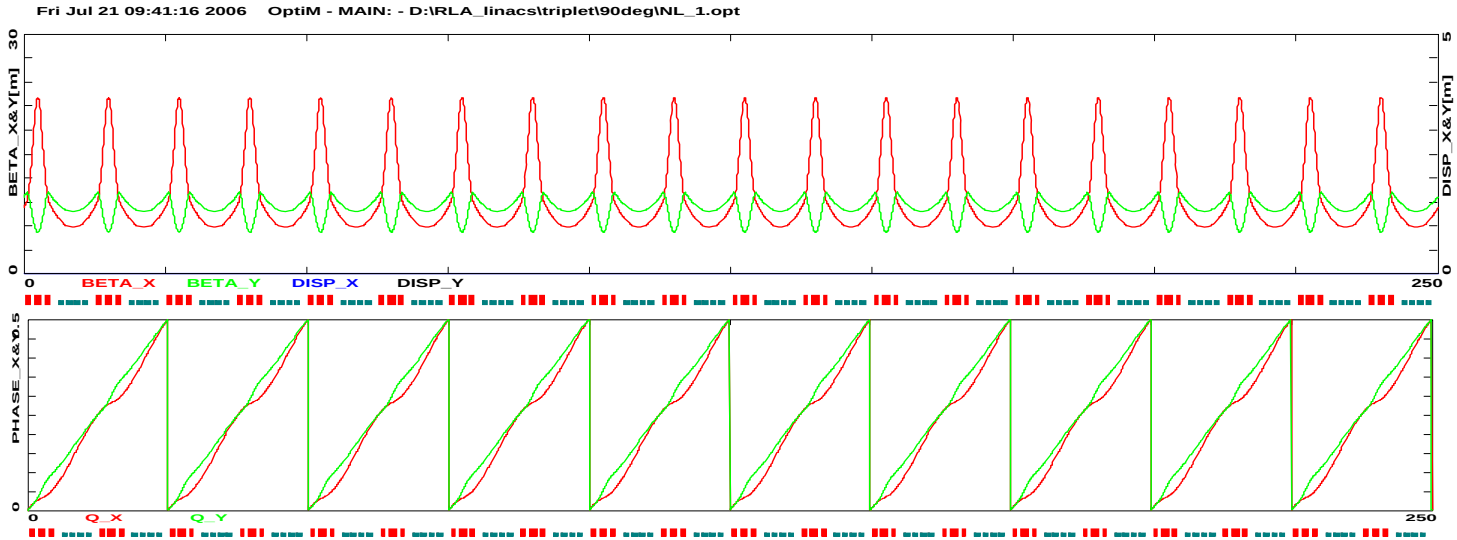
- Quadrupole focusing profile for multi-pass linacs
  - triplet vs FODO
  - Multi-pass linac (2 GeV per pass)
  - phase advance for the 1-st pass
  - beam envelopes
  - matching to the Arcs

Racetrack 7-pass RLA

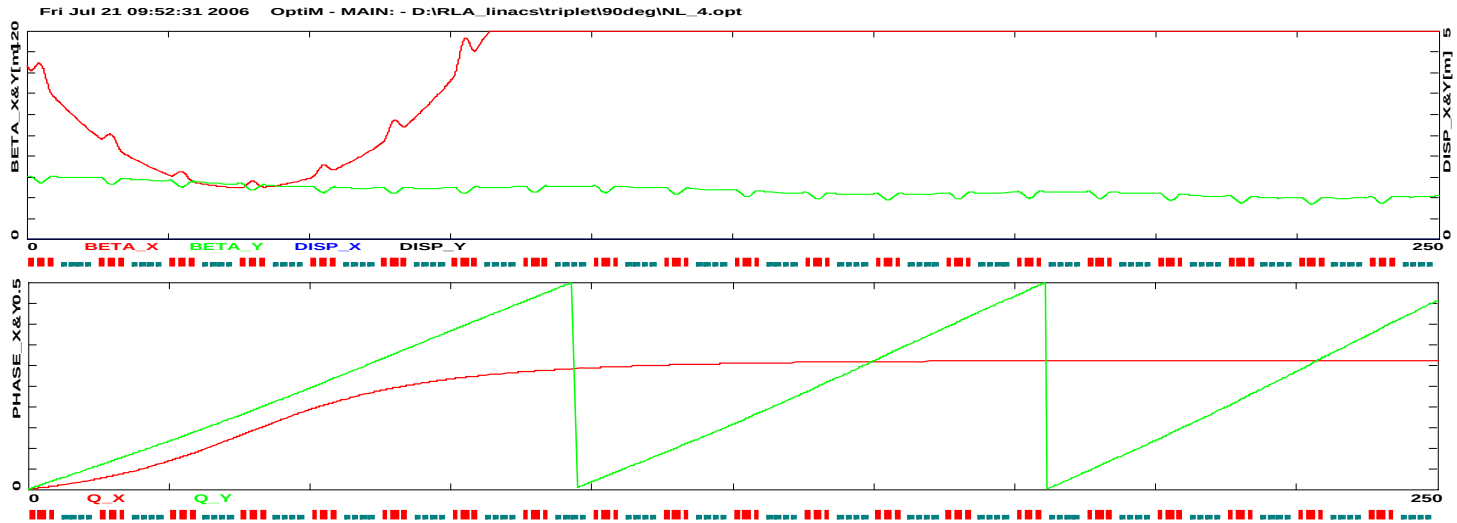


- As proposed by Milorad Popovic and Chuck Ankenbrandt
  - injection energy 2 GeV
  - multi-pass linac (2 GeV per pass)
  - Final energy 30 GeV (7-pass)
  - 800 MHz SRF
  - 5-cell cavity 26 MV/m
  - 4 cavities per module

Triplet focusing 90^0 phase adv/cell



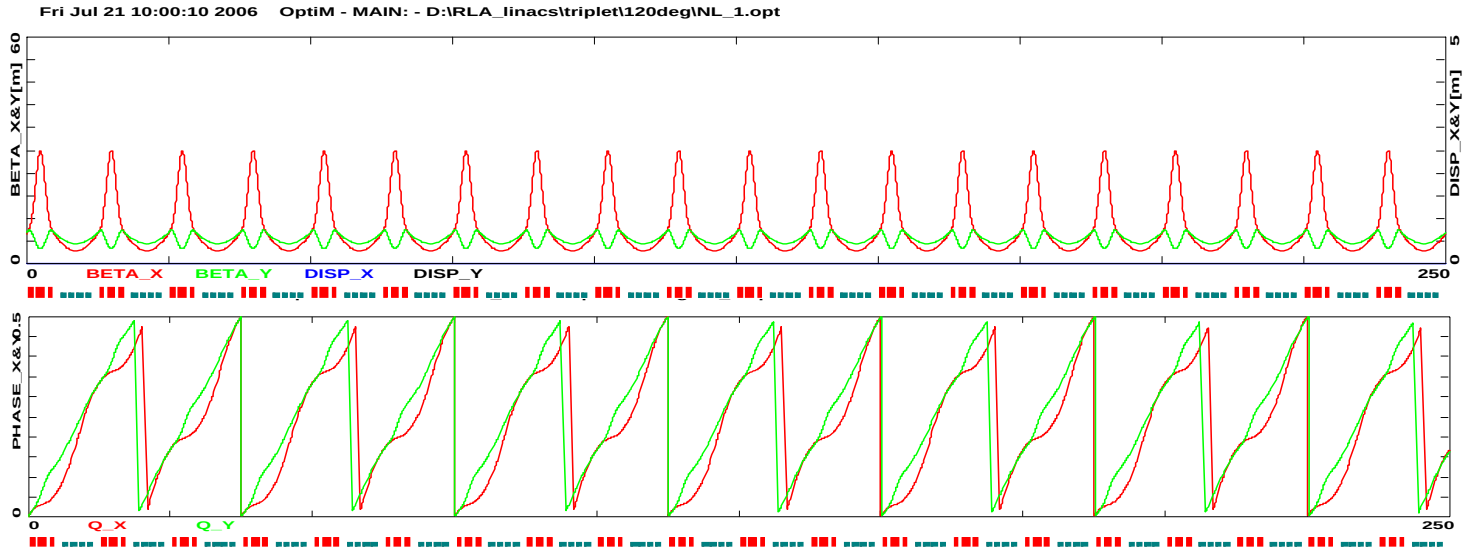
1-pass , 2-4 GeV



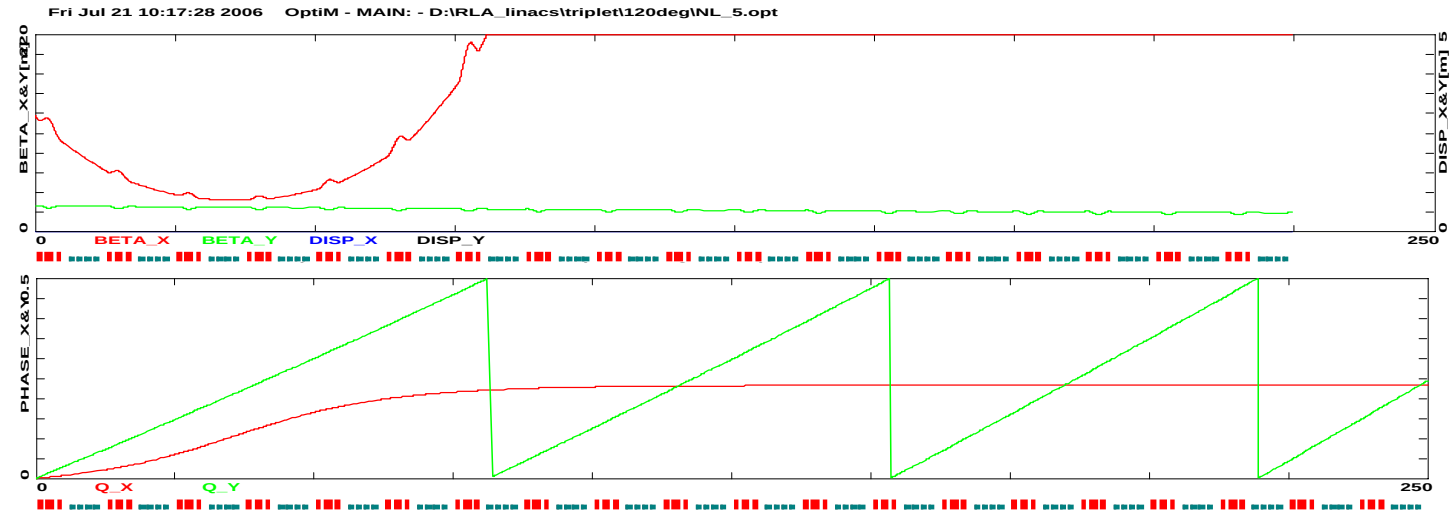
4-pass, 14-16 GeV

hor. phase adv/cell lost

Triplet focusing 120^0 phase adv/cell



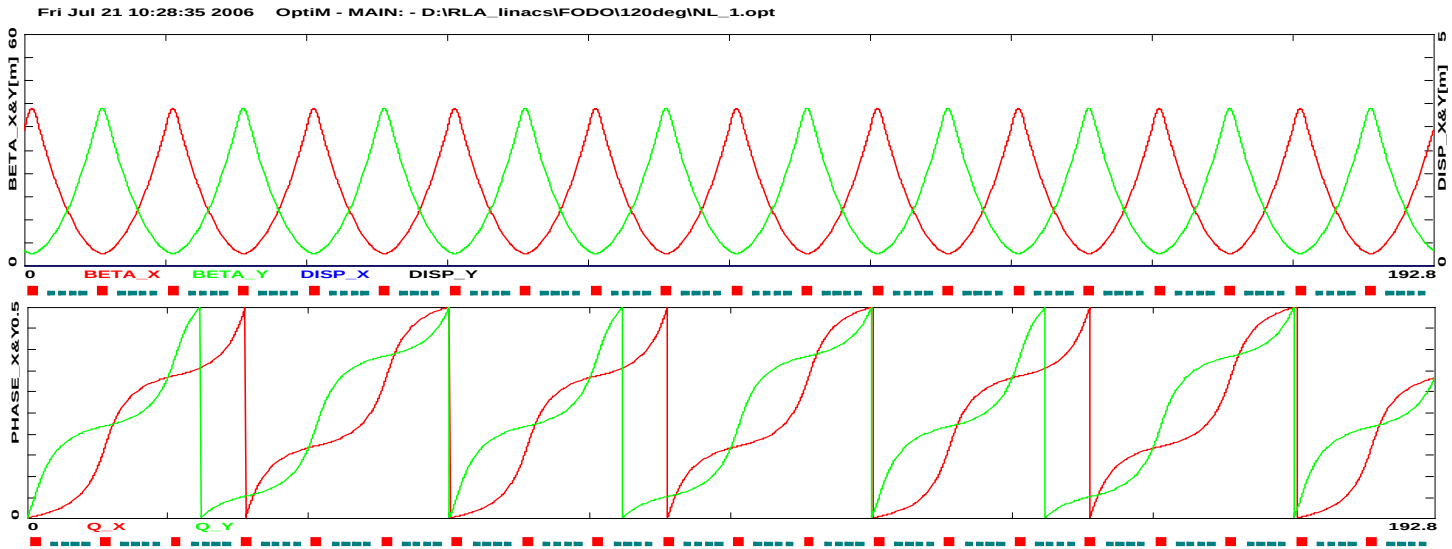
1-pass , 2-4 GeV



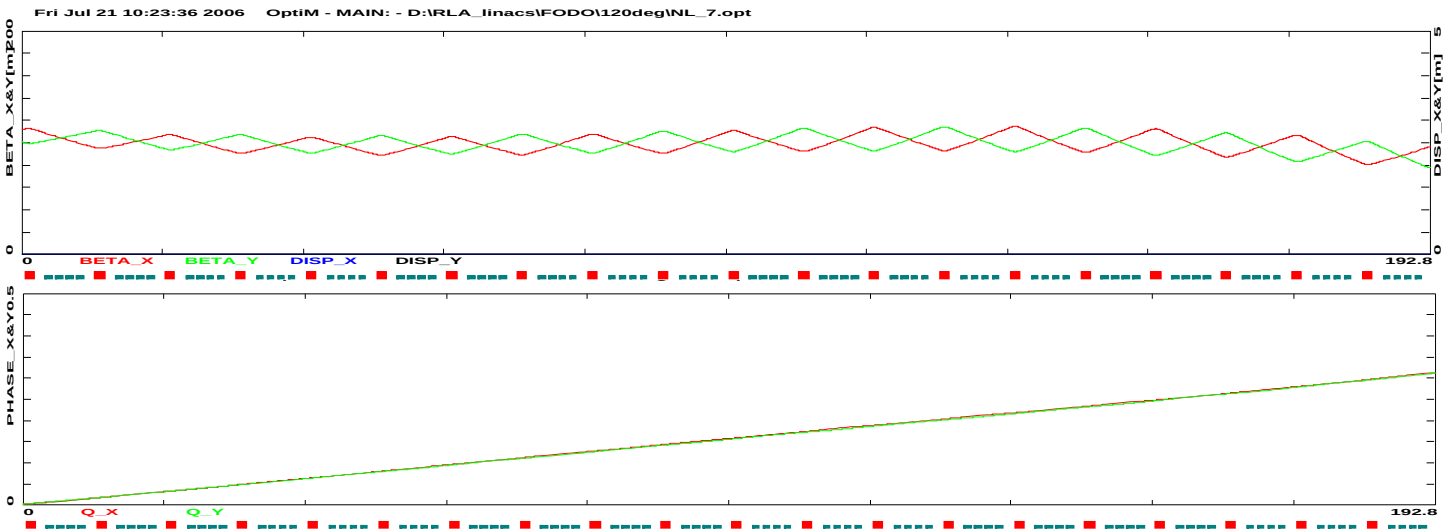
5-pass, 18-20 GeV

hor. phase adv/cell lost

FODO focusing 120^0 phase adv/cell



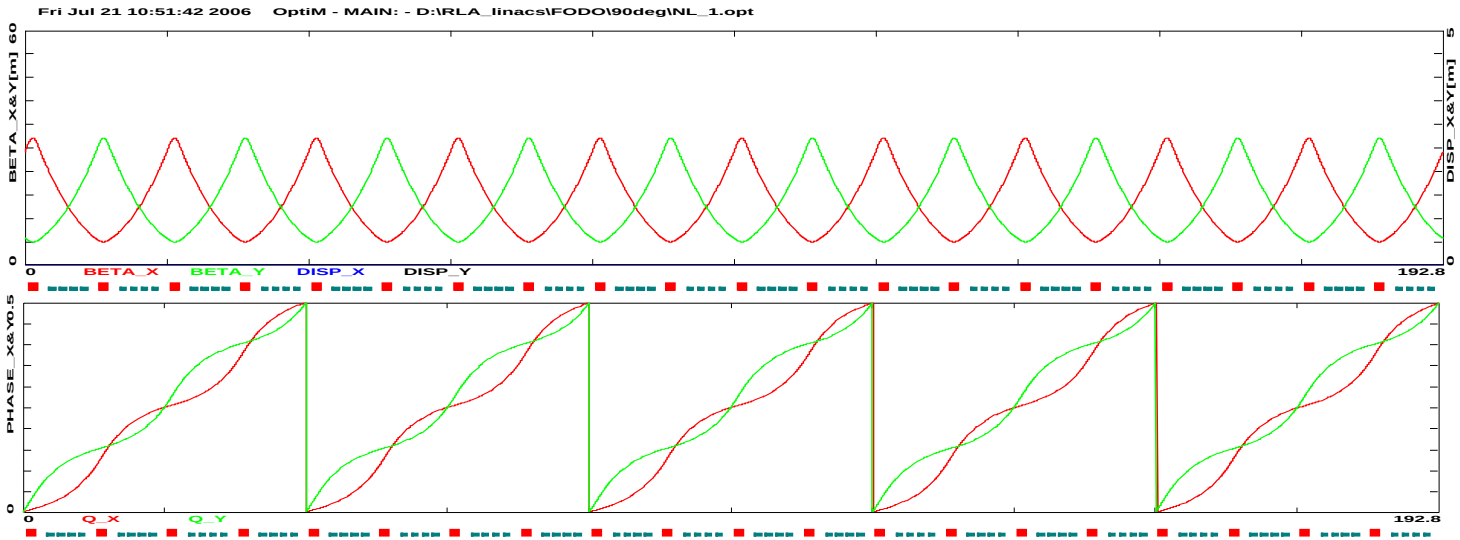
1-pass , 2-4 GeV



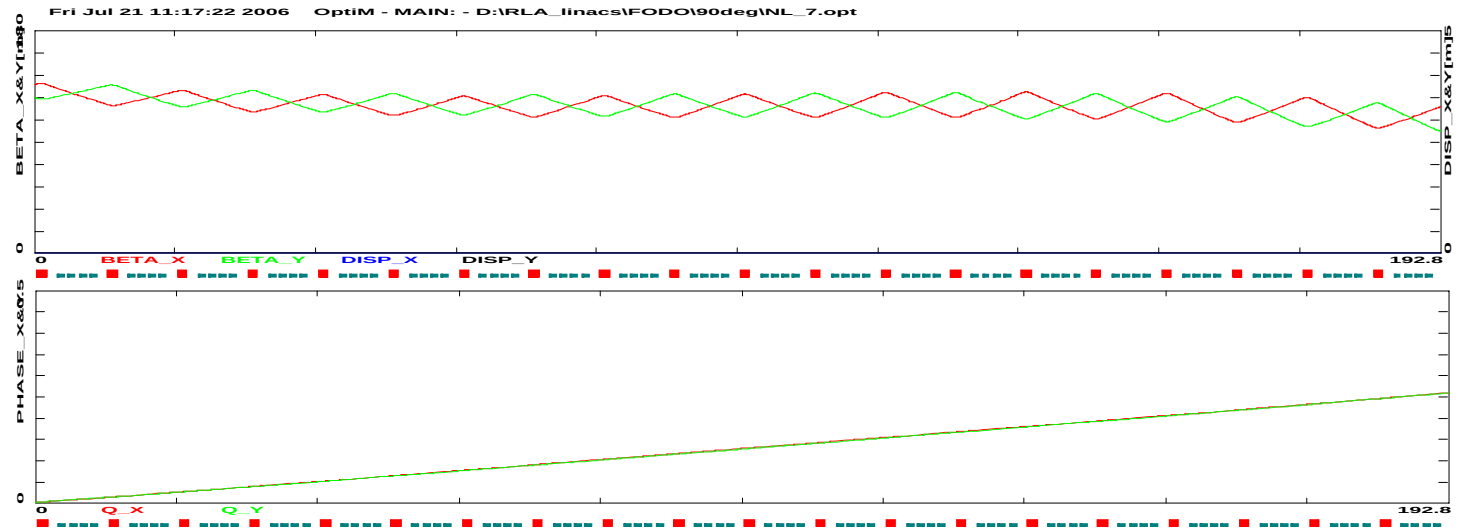
7-pass, 26-28 GeV

uniform phase adv/cell decl

FODO focusing 90^0 phase adv/cell



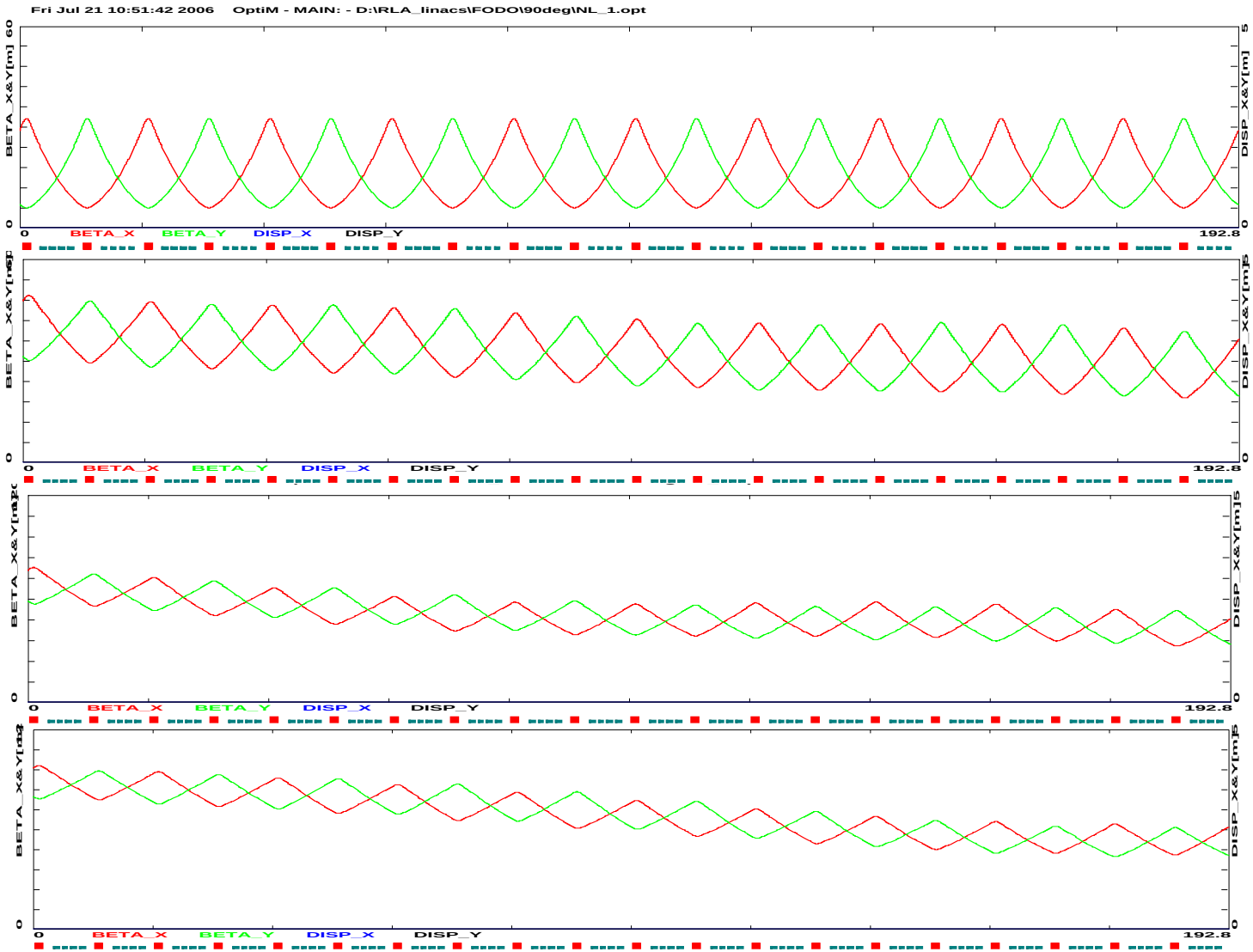
1-pass , 2-4 GeV



7-pass, 26-28 GeV

uniform phase adv/cell decl

FODO focusing 90^0 phase adv/cell



1-pass , 2-4 GeV

2-pass, 6-8 GeV

3-pass, 10-12 GeV

4-pass, 14-16 GeV

FODO focusing 90^0 phase adv/cell

5-pass , 18-20 GeV

6-pass, 22-24 GeV

7-pass, 26-28 GeV

uniform phase adv/cell decl

Summary

- FODO lattice more favorable (compared to the triplet) to accommodate large number of passes
  - uniform phase advance decrease in both planes
  - smaller variation of Twiss function – easier match to the Arcs
  - Allows to maintain 90^0 phase advance per cell for lowest passes
- 7-pass 2-30 GeV RLA (proposed by Milorad and Chuck) has a multi-pass focusing solution:
  - 90^0 FODO lattice – lowest pass linacs
  - tolerable phase 'slippage' in the higher pass linacs
  - Feasible beta matching to the Arcs