Fermilab

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First LB650 CM Fault (v2) Linac Lattice Retuning

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Accelerator Physics Meeting

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Retuning Strategy

- The loss of an entire CM is a major perturbation.
  Within a drift space (disabled CM), one has $\beta(s) = \beta^* (1 + s^2/\beta^*)$.
  The growth of the beam size within the failed module is mitigated by increasing β* - the value at the upstream end of the failed CM.
- An increase in the longitudinal β in the upstream (SSR2) module is traded for a reduction within the the failed module.
- The transverse lattice functions are matched
  to their unperturbed values, at the downstream end of LB650 CM-3.
  The longitudinal beam size is constrained to an intermediate value.
- At the downstream end of LB650 CM-4, the longitudinal lattice functions are matched to their unperturbed values.
- There is an abrupt jump in longitudinal emittance (about 10%) which could probably be reduced by making the longitudinal envelope size reduction more progressive.
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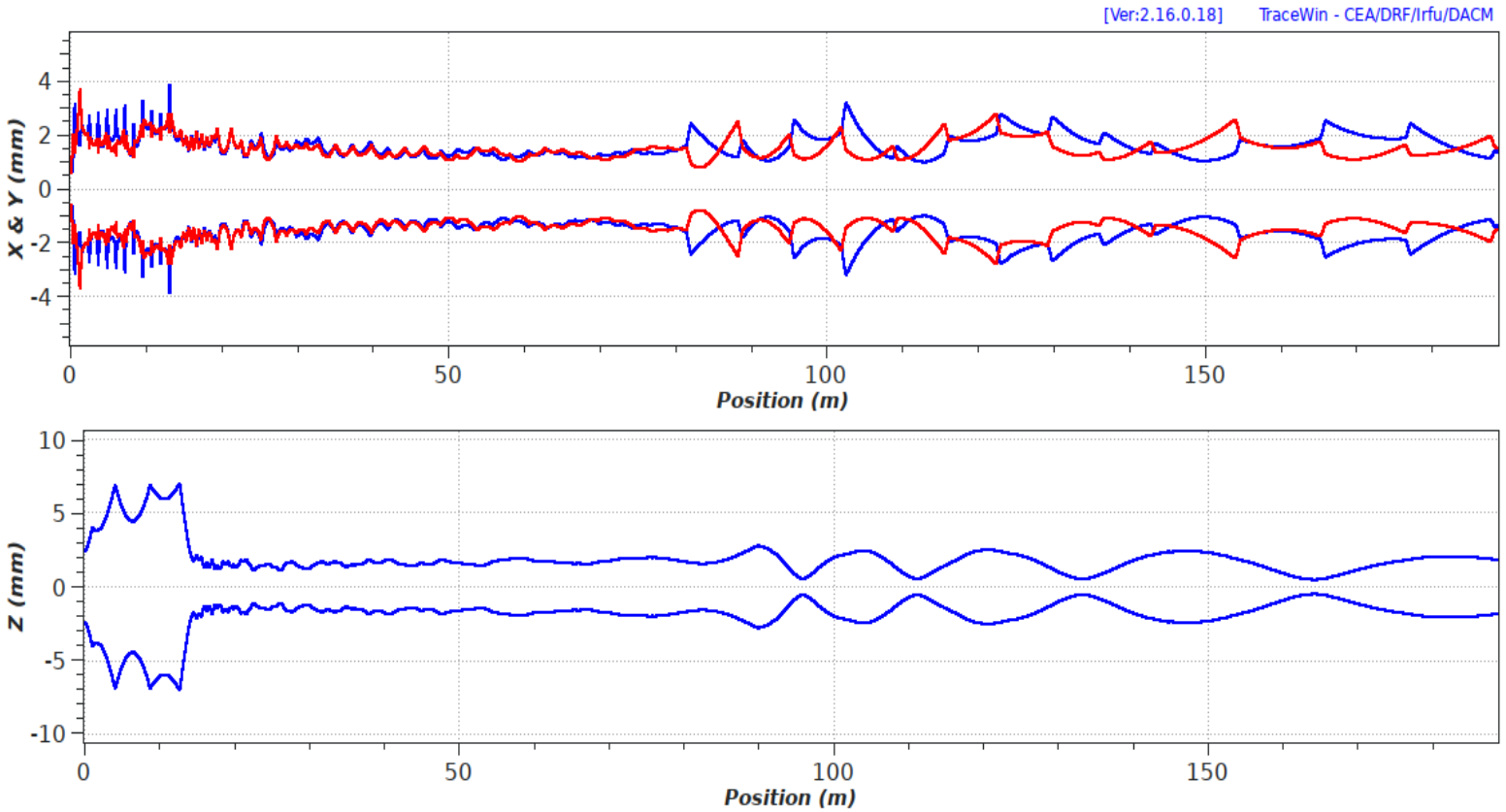
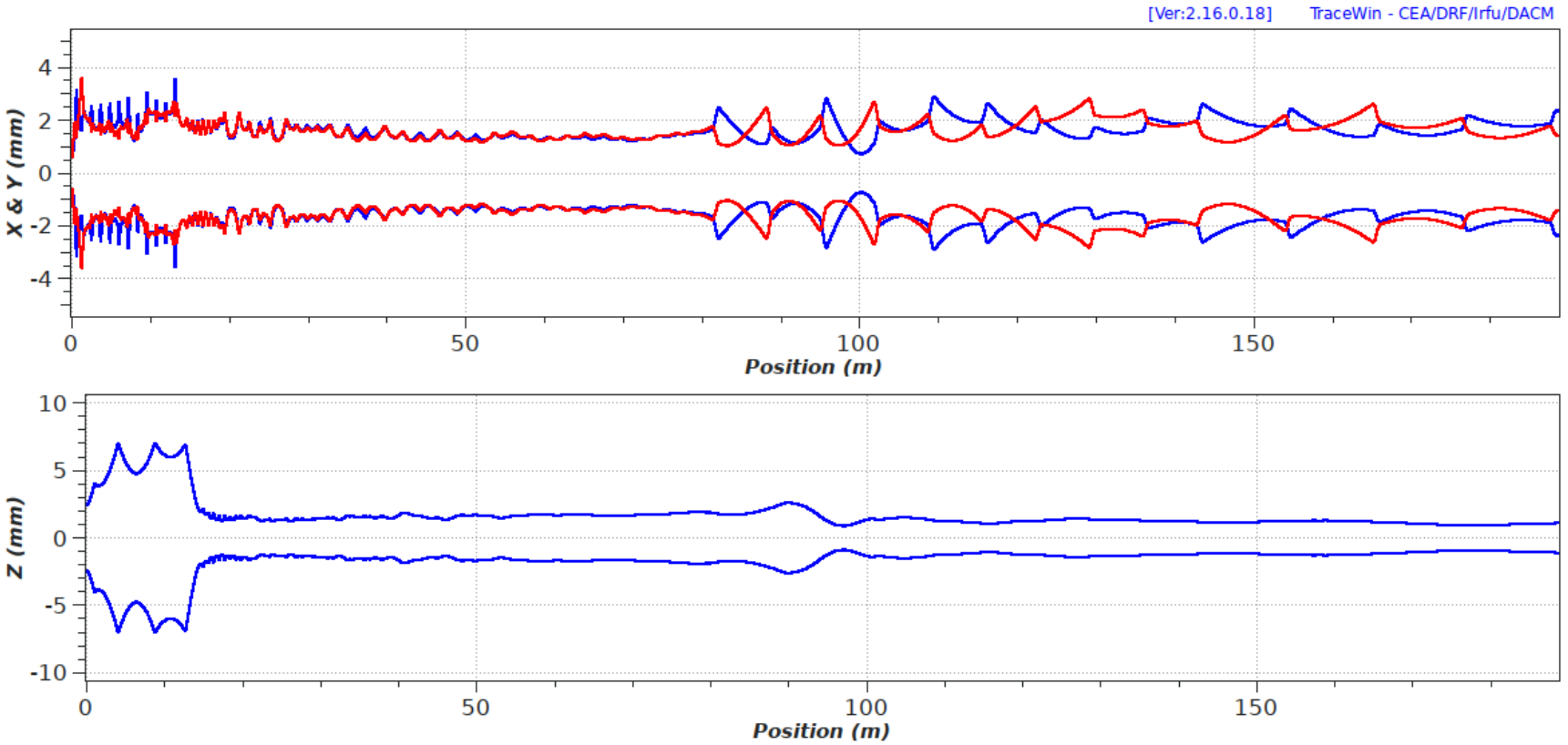
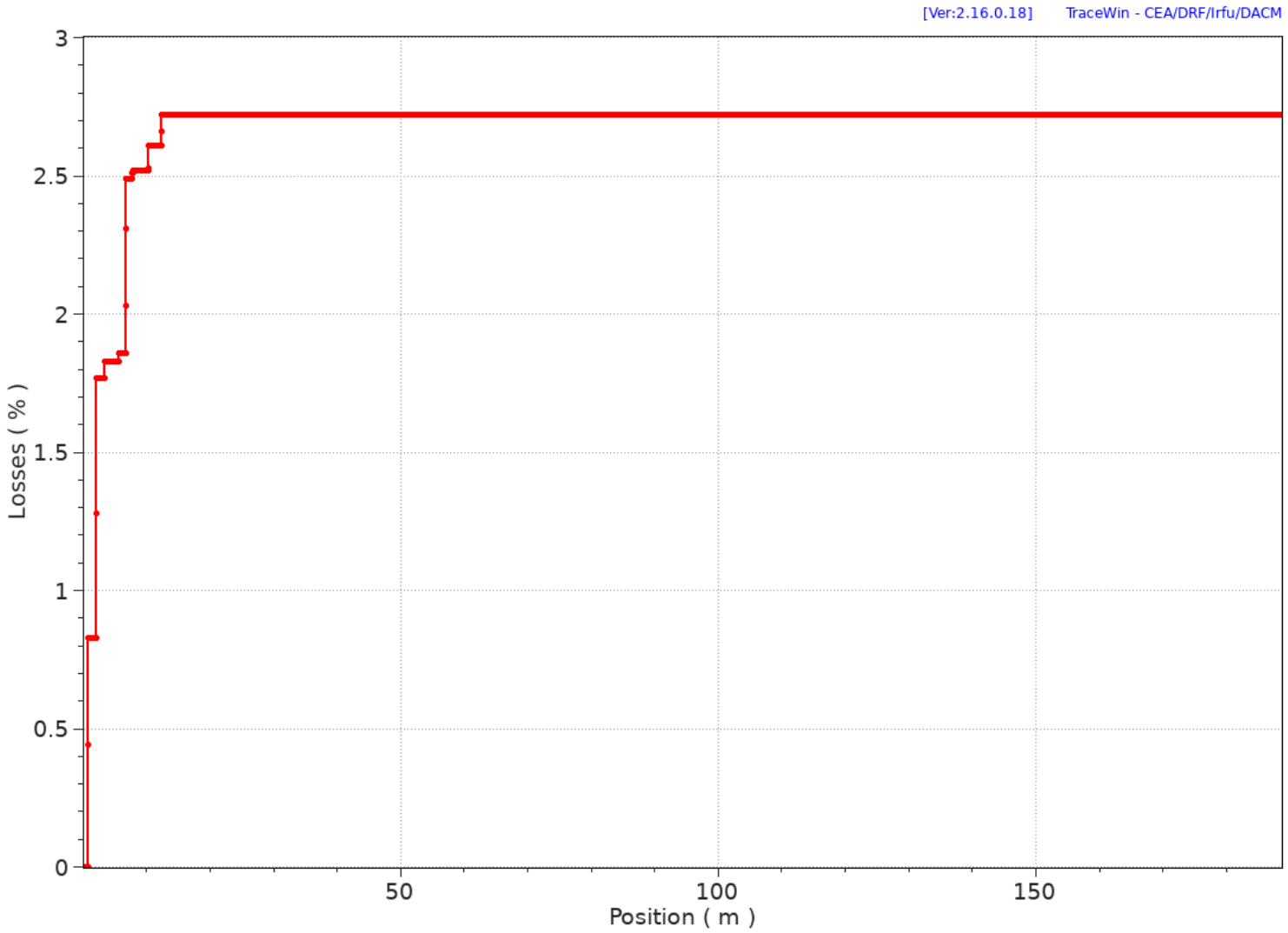
Perturbed Envelope



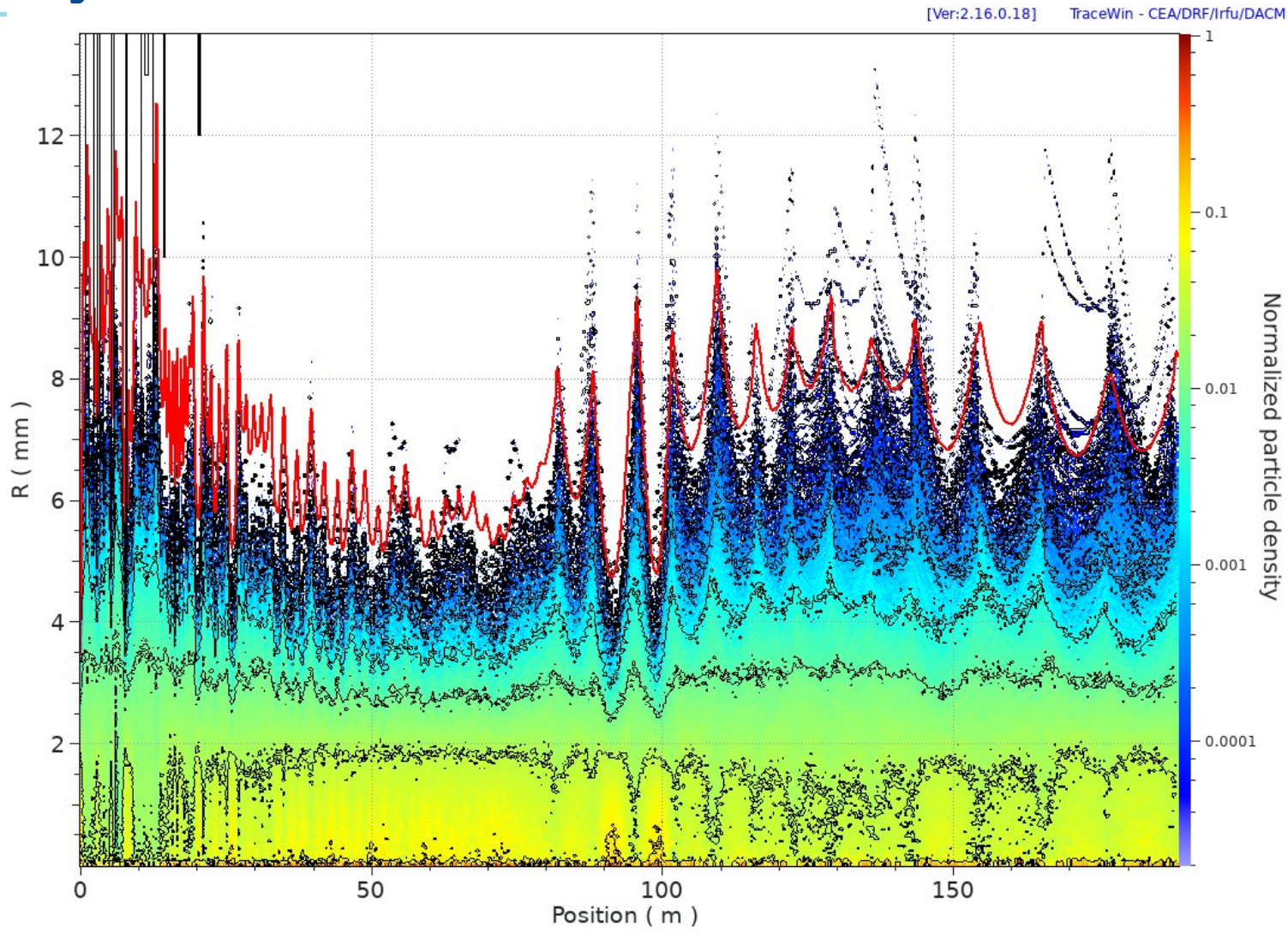
Retuned Lattice Envelope (Partran Mode)

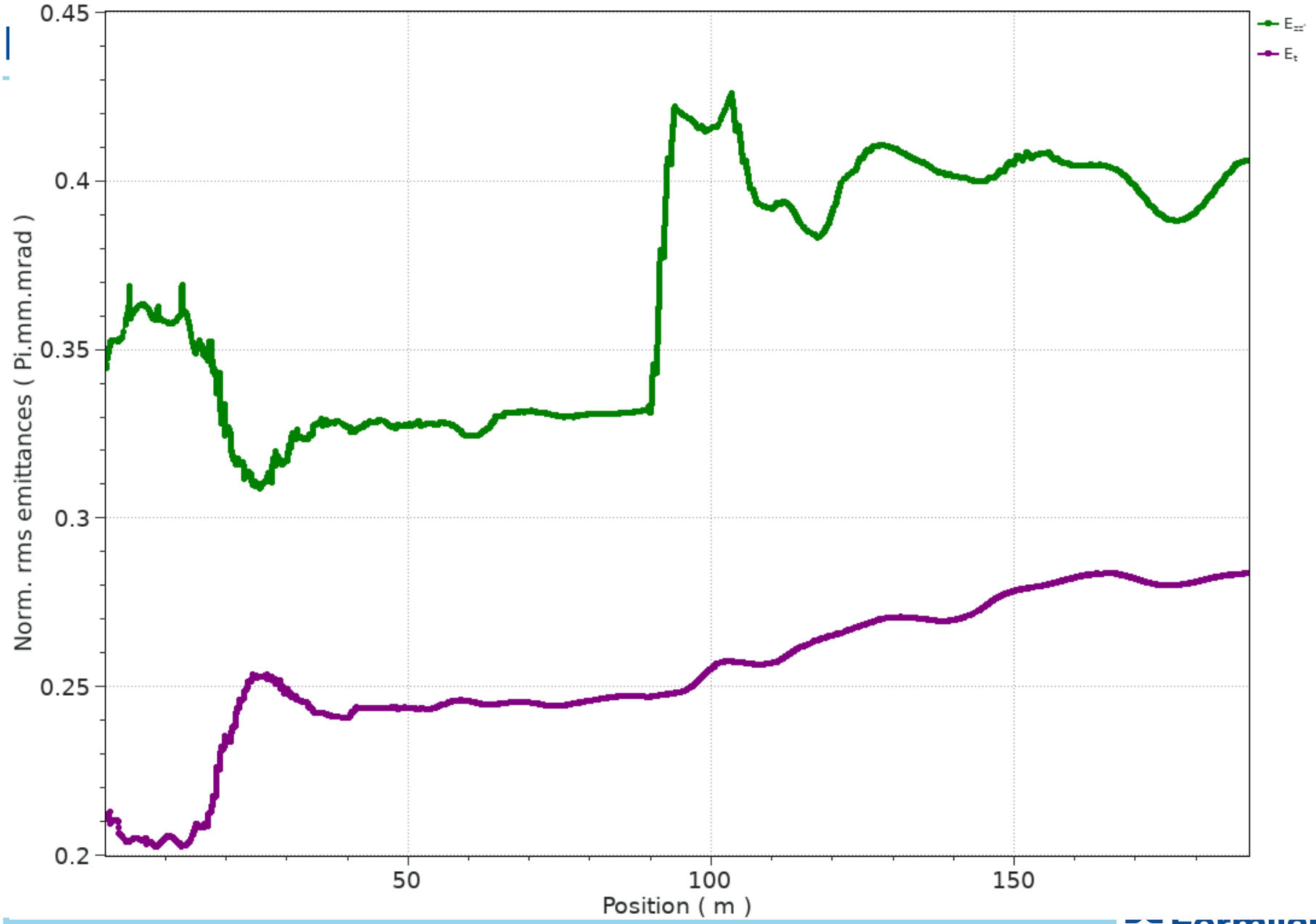


Losses

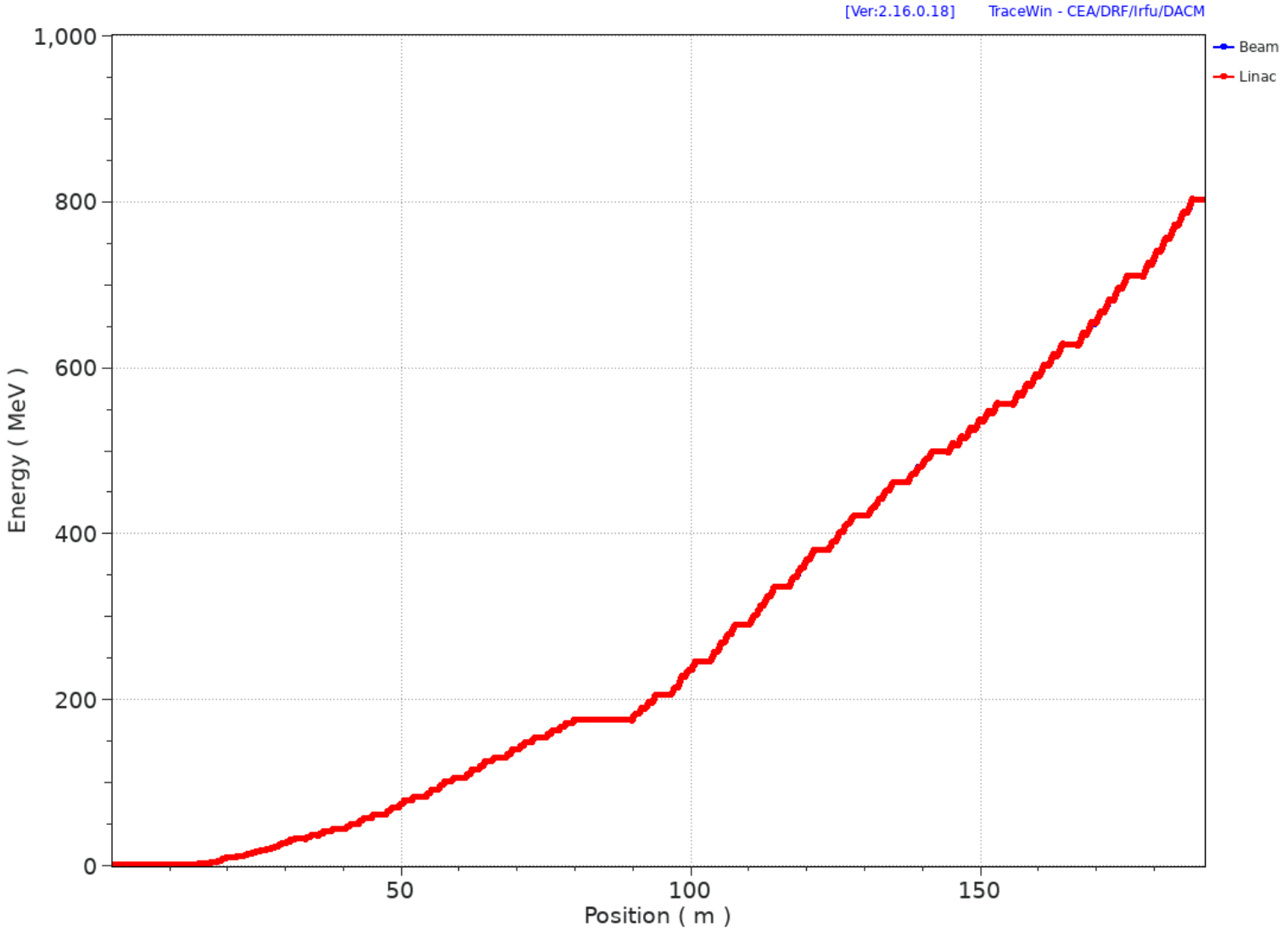

[Ver:2.16.0.18]
TraceWin - CEA/DRF/Irfu/DACM
Losses (%)
Position (m)
0
0.5
1
1.5
2
2.5
3
50
100
150

Density


[Ver:2.16.0.18]
TraceWin - CEA/DRF/Irfu/DACM
R (mm)
Position (m)
Normalized particle density
1
0.1
0.01
0.001
0.0001
0
50
100
150
2
4
6
8
10
12


0.45
0.4
0.35
0.3
0.25
0.2
Norm. rms emittances (Pi.mm.mrad)
50
100
150
Position (m)
E
E

Energy


[Ver:2.16.0.18]
TraceWin - CEA/DRF/Irfu/DACM
Beam
Linac
1,000
800
600
400
200
0
Energy (MeV)
50
100
150
Position (m)