New MICE Beamline Tune MAY07

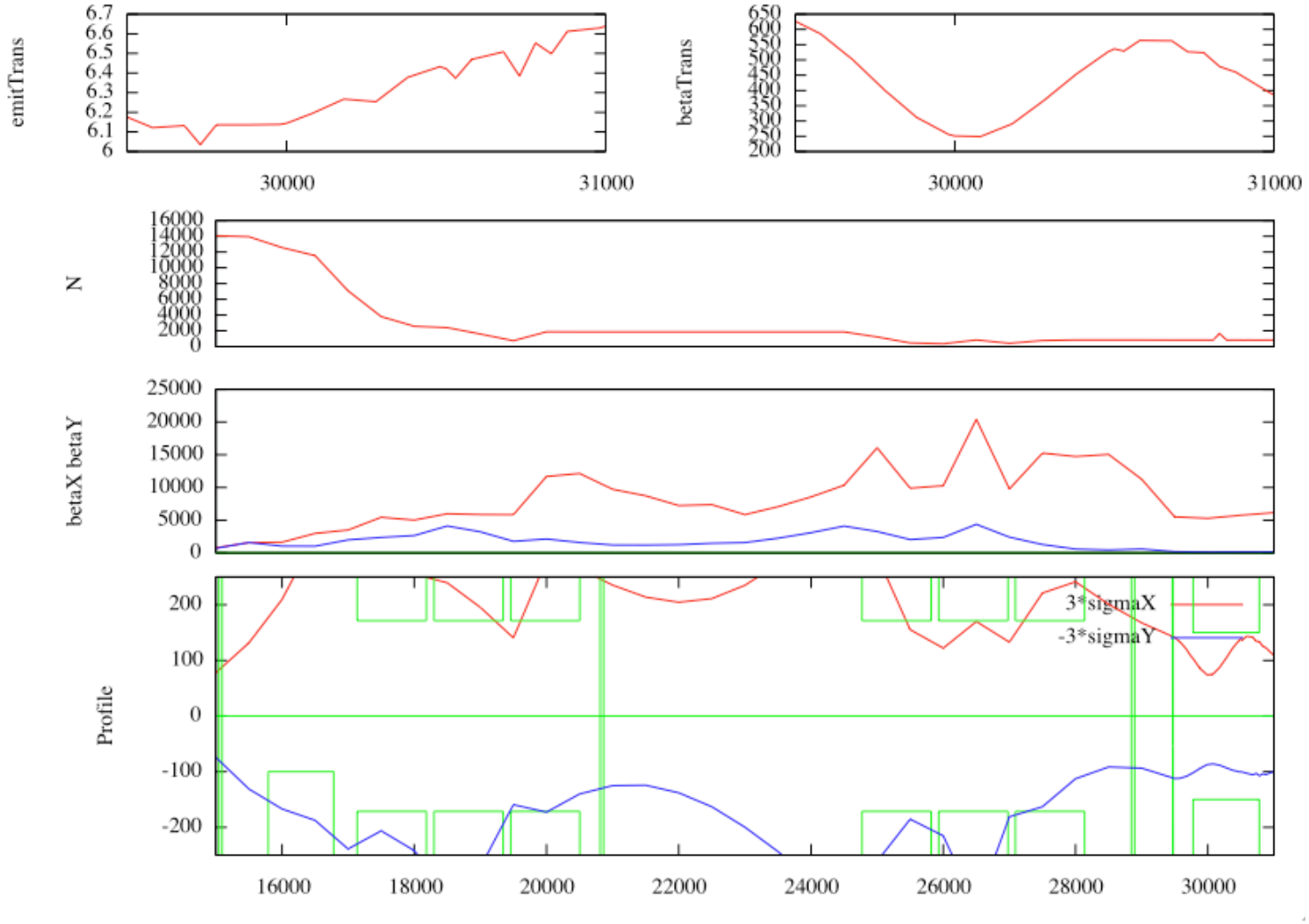
Dazhang Huang
Tom Roberts

Illinois Institute of Technology

Background

- G4beamline gives a significantly higher emittance than TURTLE for a given tune.
- This is partly due to the better multiple-scattering model in G4beamline, but is mostly due to the approximation in TURTLE that prevents it from accurately handling the Diffuser in the Tracker1 fringe field.
- We are now attempting to tune the beamline using G4beamline, using an initial μ^+ distribution obtained by tracking π^+ from the target to downstream of the DecaySolenoid, just upstream of the ProtonAbsorber.
- At that point the beam is 80% π^+, and some of those will decay and put μ^+ into the cooling channel -- we have not had time to assess the effects of this, but it will surely increase the emittance.
- Note the very large loss early on (B2-Q6) is from the very wide momentum distribution of the initial μ^+.
- While the desired emittance was achieved, the match into Tracker1 is not very good.

6 π mm-rad, 200 MeV/c



Parameters

Beam comes from a simulation of π^+ from the target, μ^+ sampled downstream of DecaySolenoid, just upstream of ProtonAbsorber.

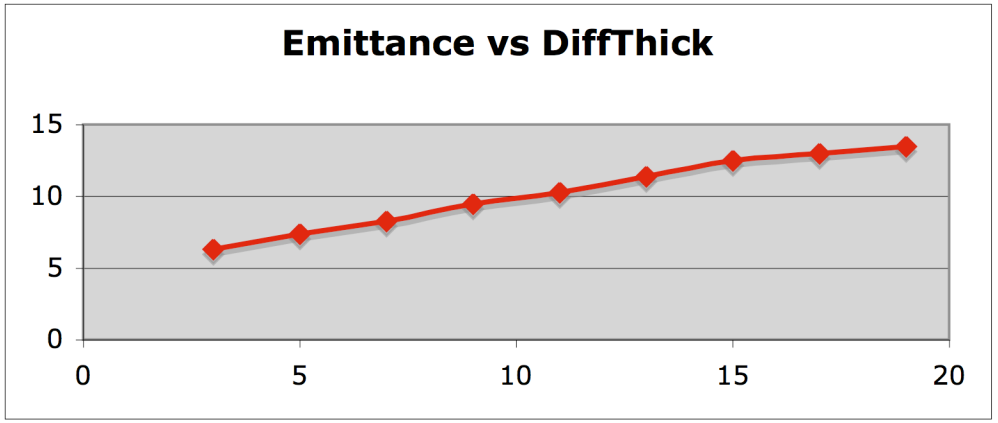
Parameter	Value
Q4	1.1949
Q5	-1.6007
Q6	1.0621
Q7	1.0718
Q8	-1.6214
Q9	1.1966
DiffThick	3 mm

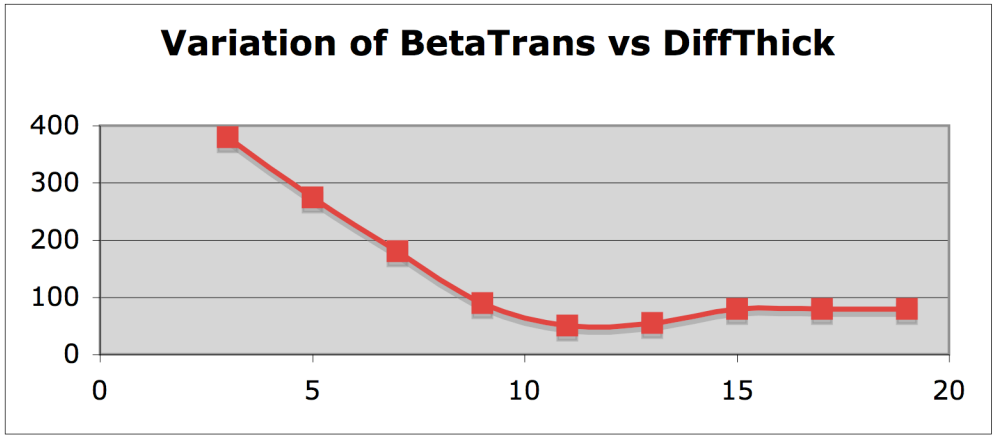
Normalization

- As before, use LAHET, G4beamline, and MARS to simulate p Ti $\Rightarrow \pi^+ + X$, with the π^+ in the acceptance
- The three programs differ by ±17%
- Using our standard targeting assumptions:
  - TOF0 Singles 3.6 MHz
  - Good μ^+ 1417 events/ms
- This is about a factor of 2 more Good μ^+ than before

- Assuming we reduce the target depth to limit the rate:
  - TOF0 Singles 1.5 MHz
  - Good μ^+ 600 events/ms

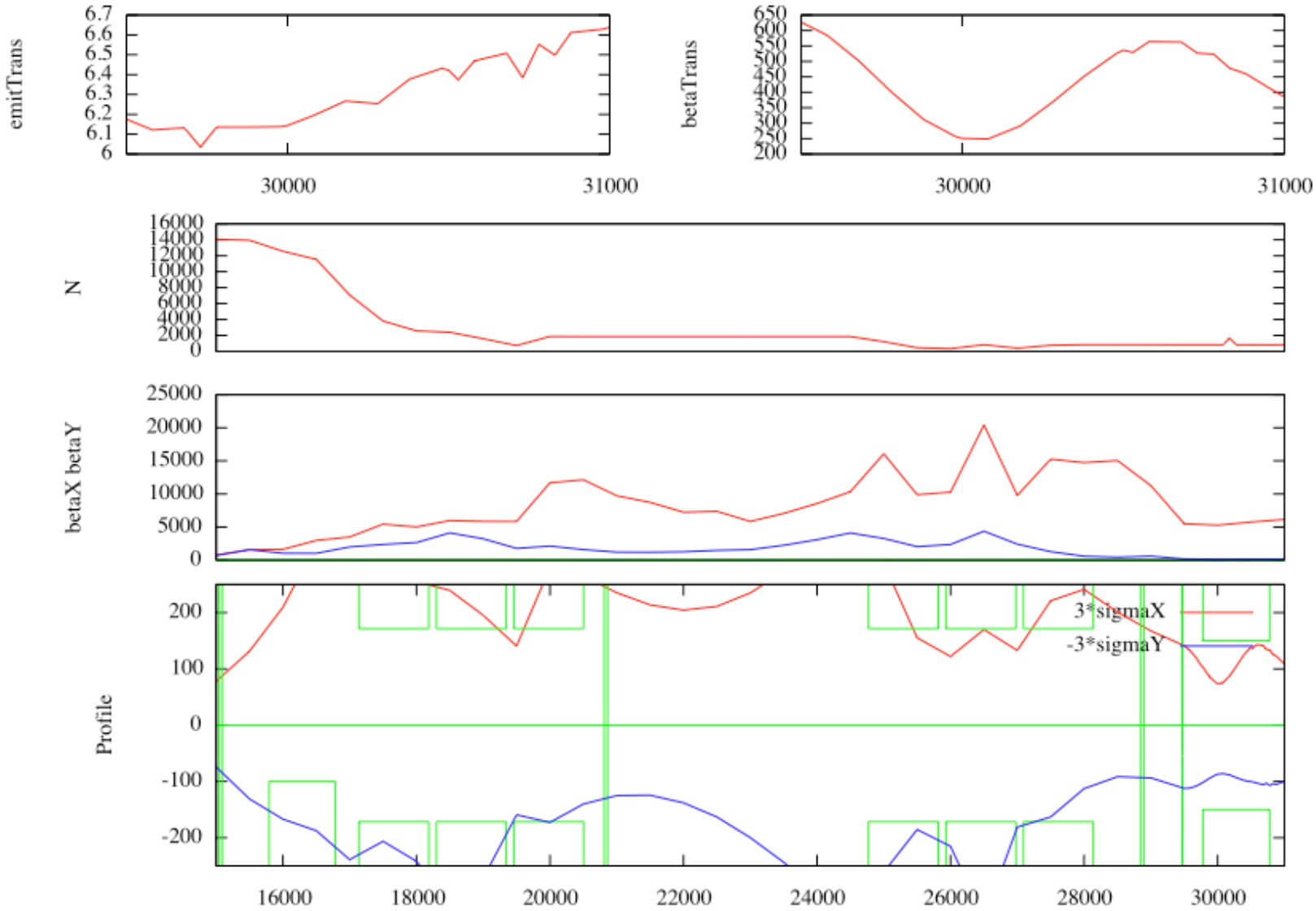
Vary DiffThick



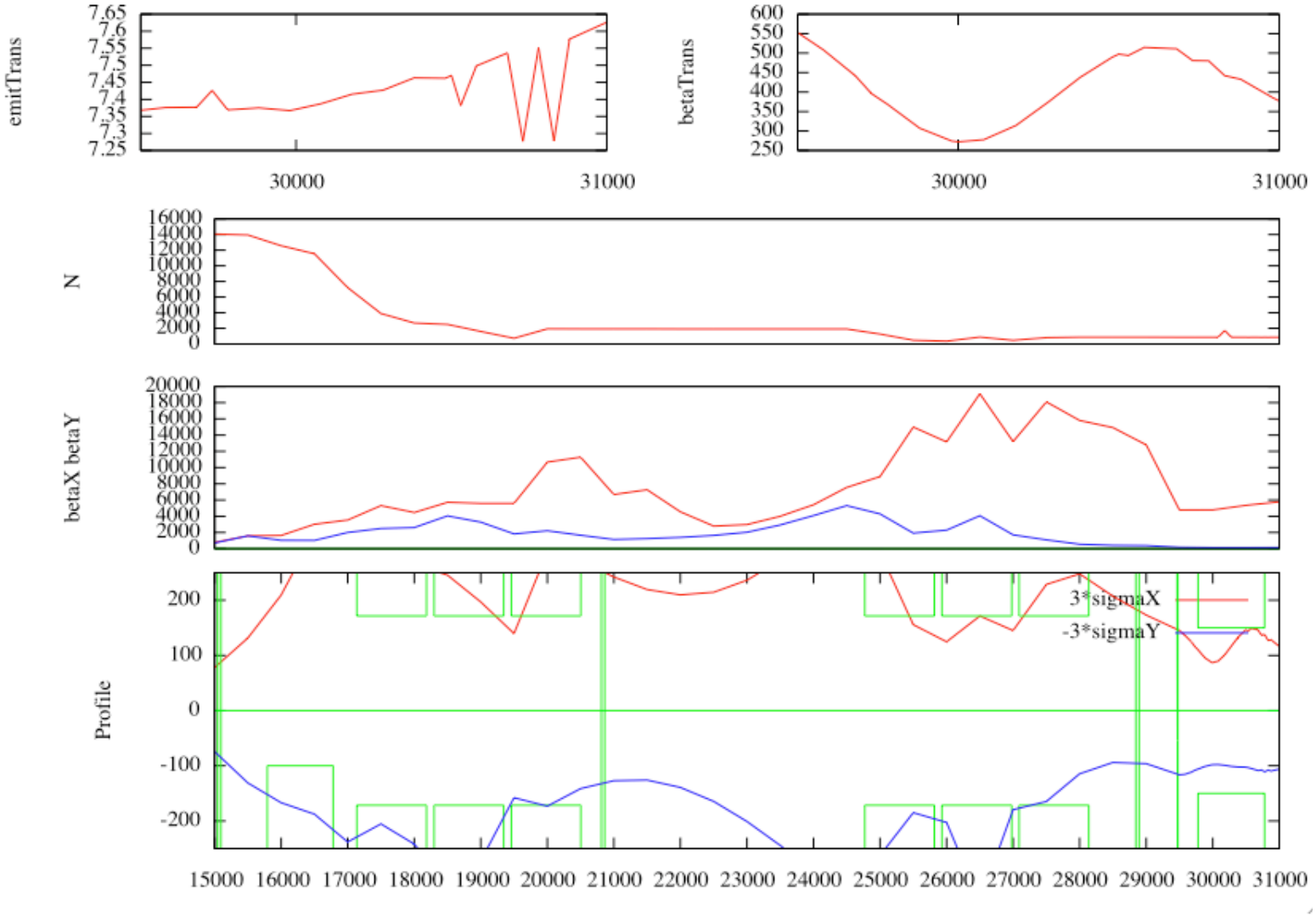


There is more scraping above 15 mm.

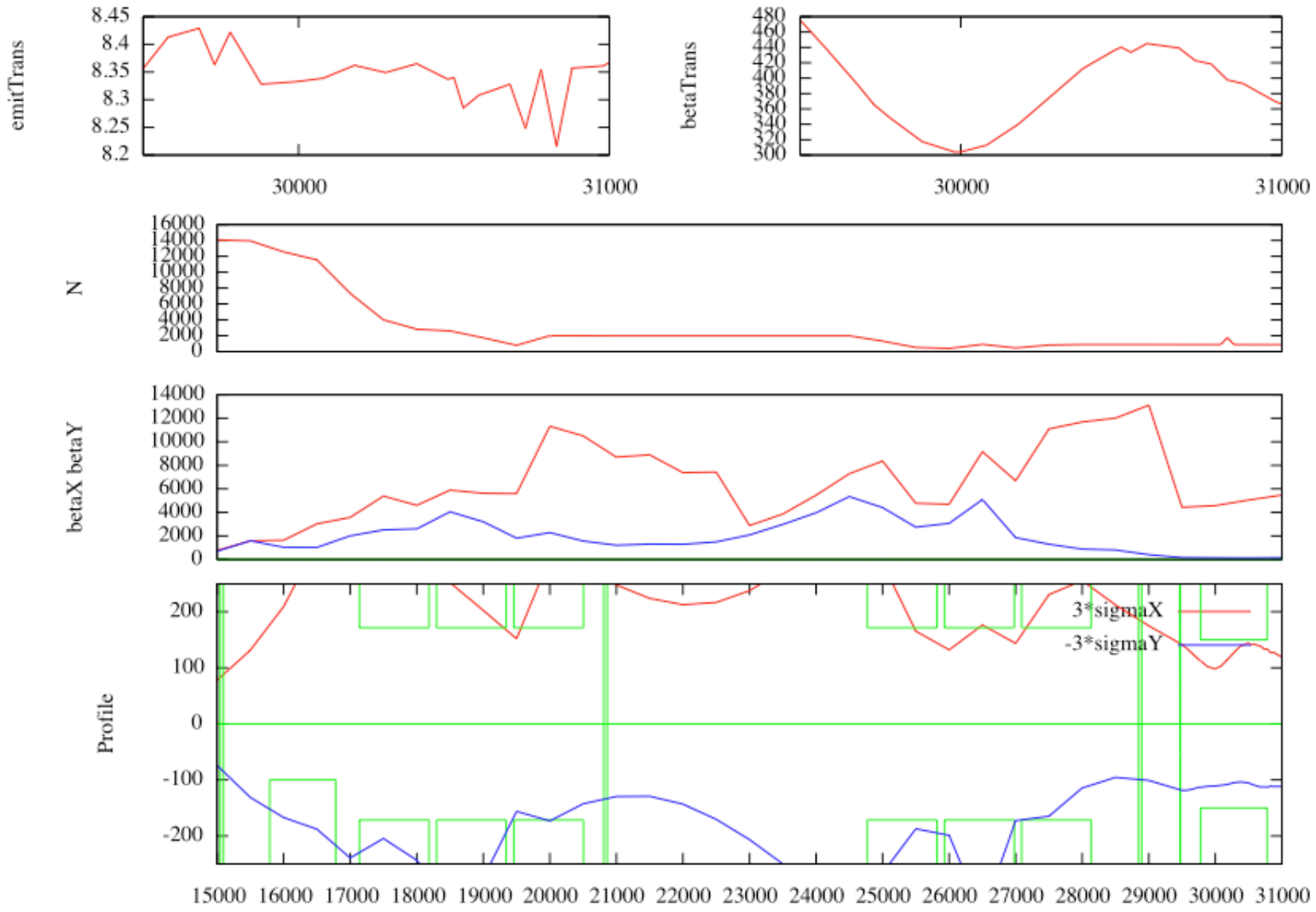
Vary DiffThick -- 3 mm



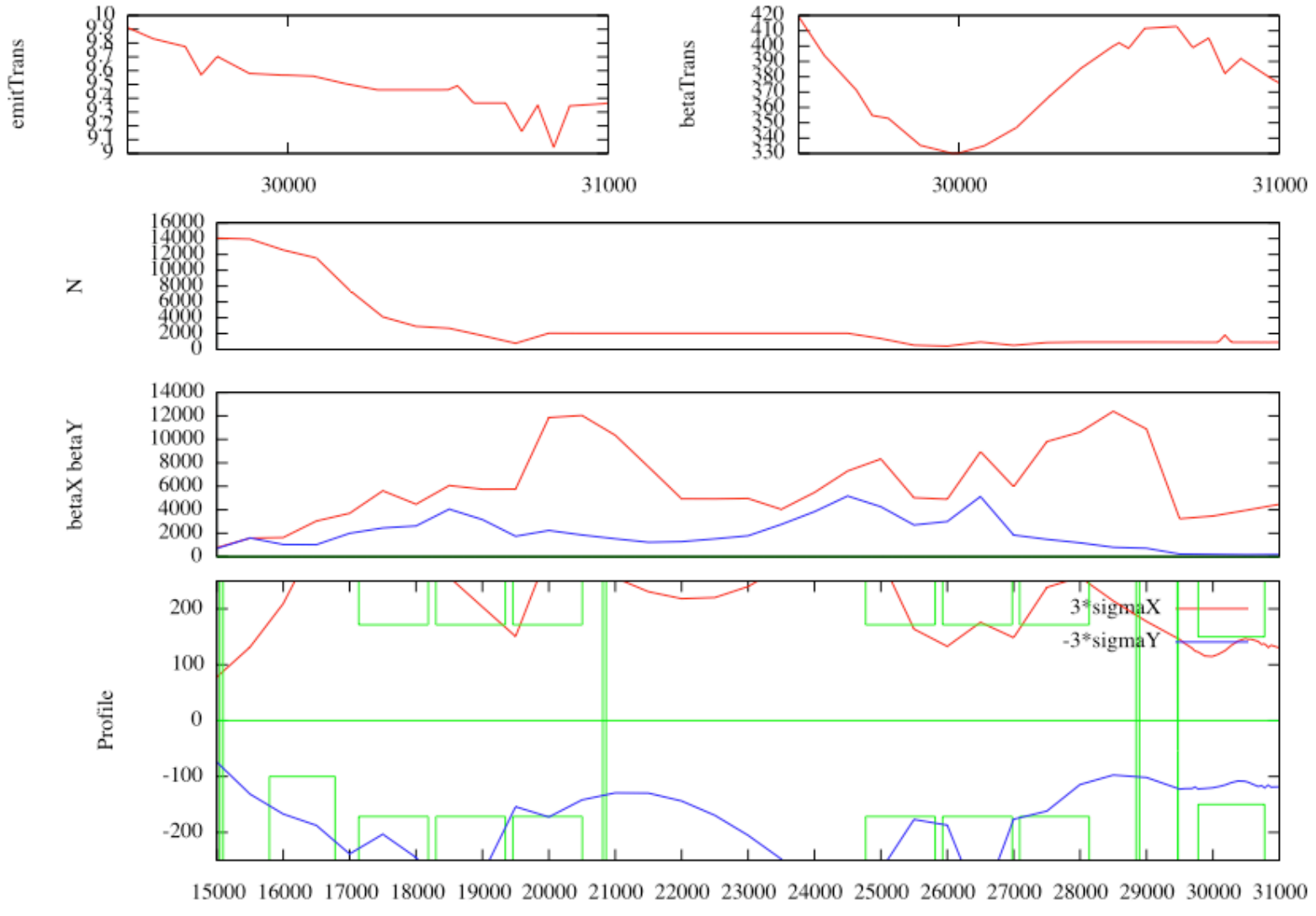
Vary DiffThick -- 5 mm



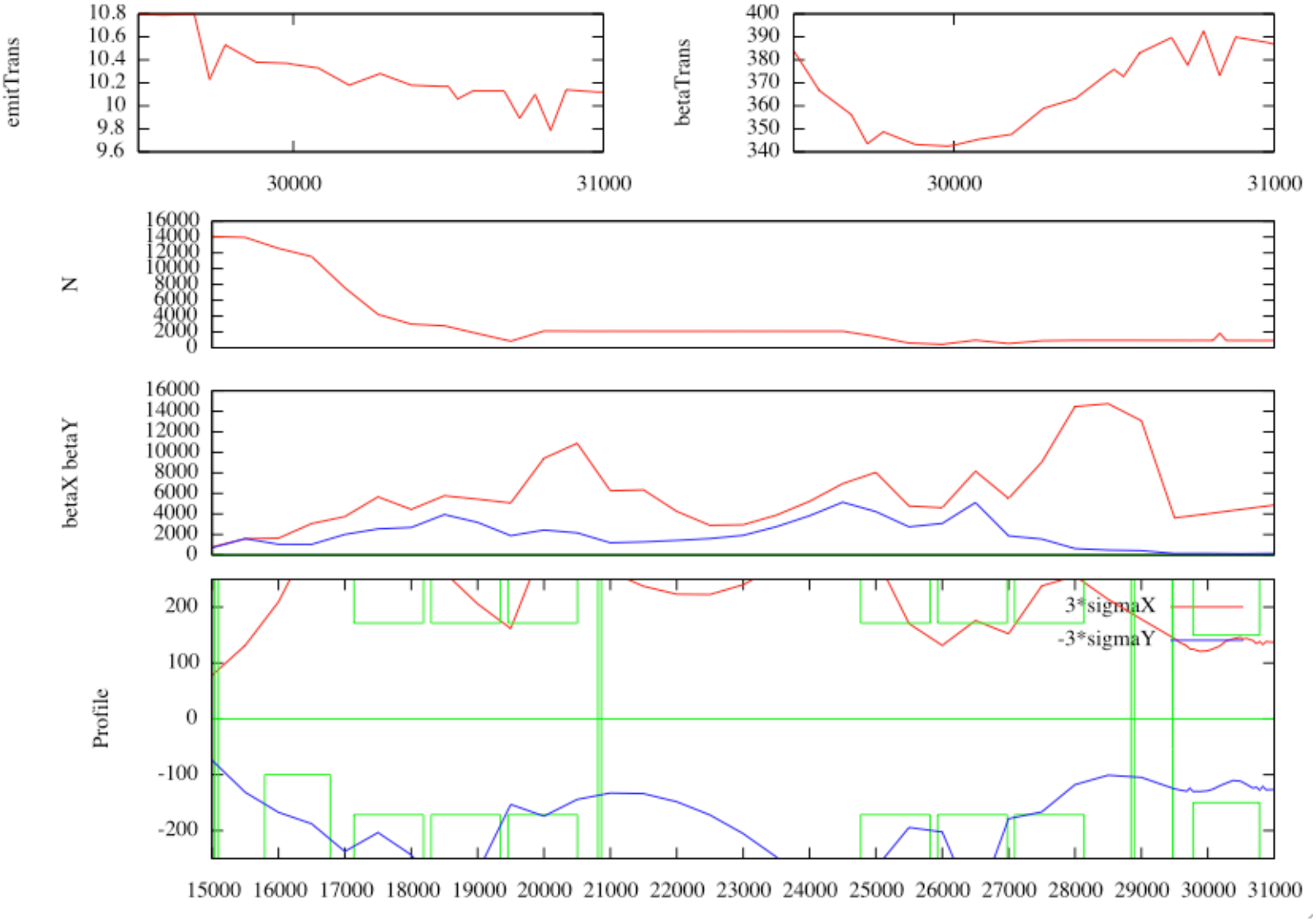
Vary DiffThick -- 7 mm



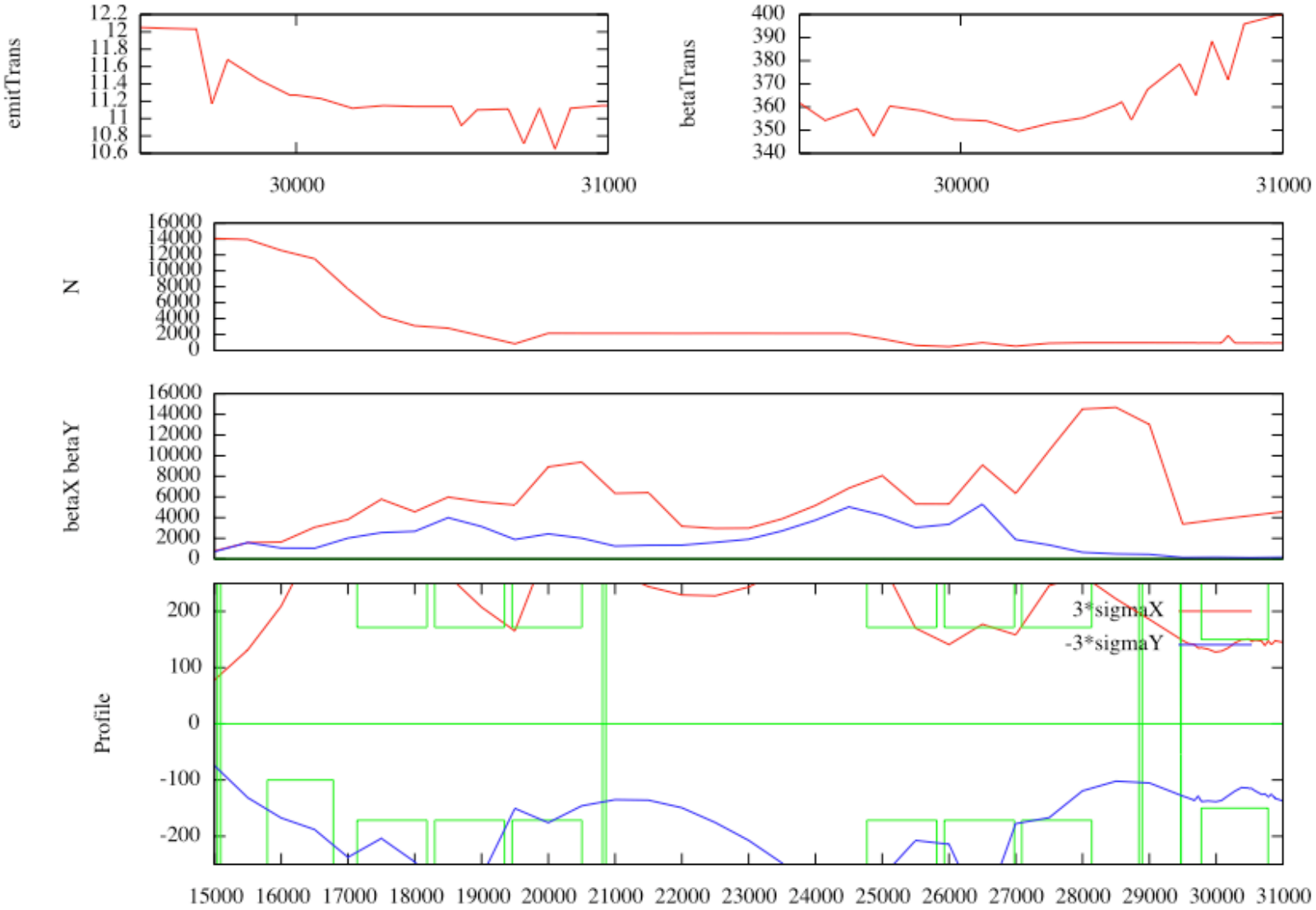
Vary DiffThick -- 9 mm



Vary DiffThick -- 11 mm



Vary DiffThick -- 13 mm



Vary DiffThick -- 15 mm