Tools for booster steering

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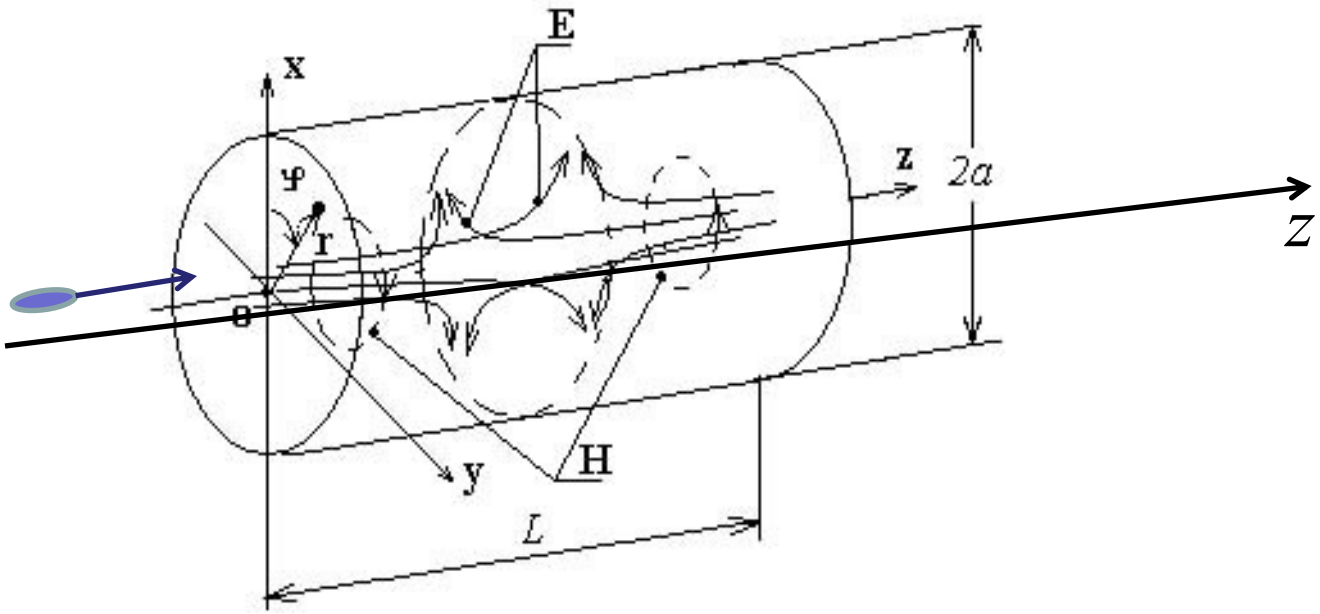
Definition of problem



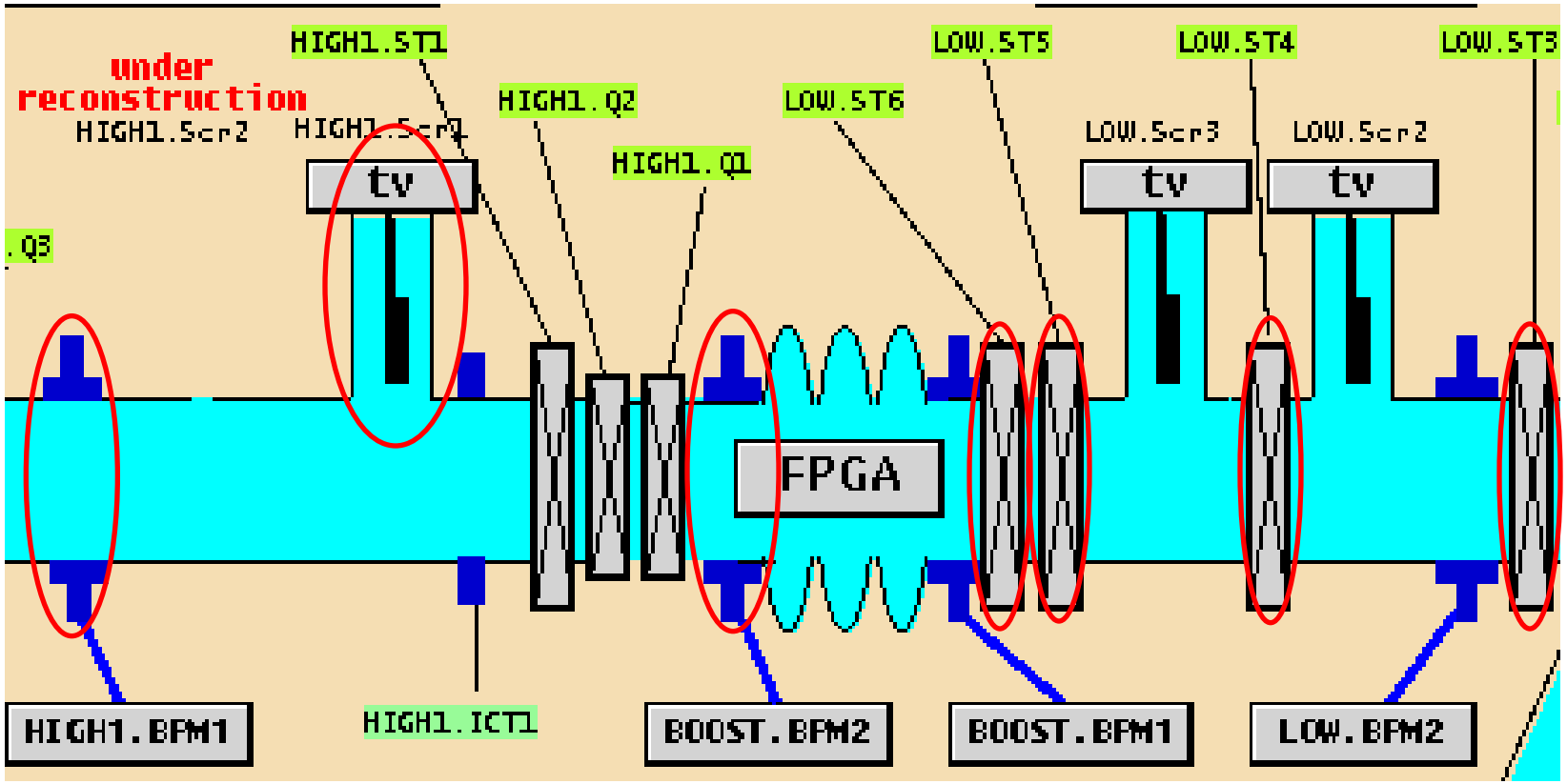
Booster steering procedure is to transport the beam by orbit where transverse deflections of particle are minimum depending on booster phase.

The variables with asterisks are the variables in coordinate system connected to diagnostic system.

The variables without asterisks are variables in system connected to booster central axes.

So in some approximation the problem mathematically can be formulated finding offset and orientation between 2 coordinate systems

Booster region snapshot from ddd panel

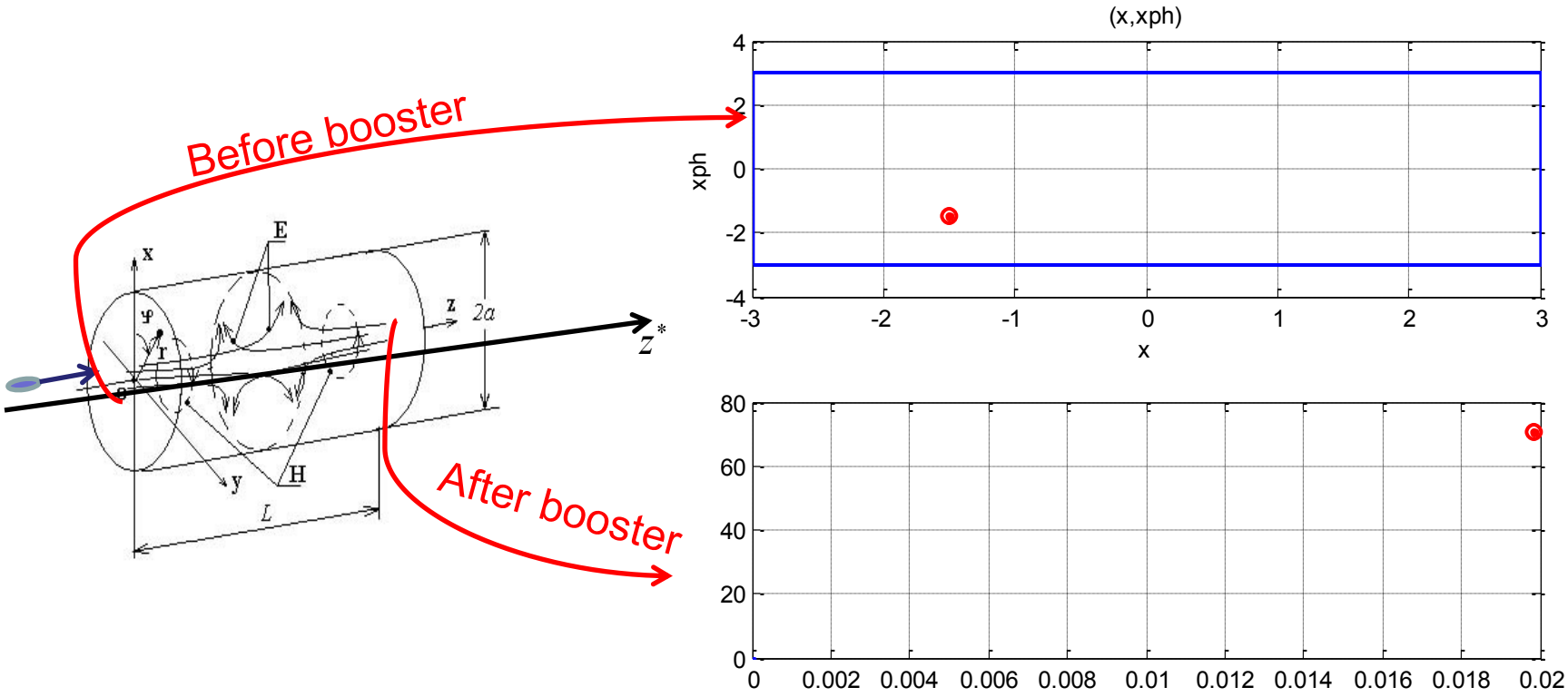


Degree of freedom is 4 (x, x', y, y') therefore for correct transportation of beam 4 steerers are needed.

In the example we will consider LOW.ST3, LOW.ST4, LOW.ST5, LOW.ST6

Separate searching

Four dimensional search of best orbit in whole acceptance of booster can be very long procedure.
There is a function for independent finding approximate place of good orbit for (x,xph) or for (y,yph)



Steps of steering procedure for MATLAB

1. Run matlab2.bat file from WINDOWS or from LINUX (This automatically will load needed libraries)

2. Type help steeringmexfunction to see all possible options for steering library interface function

3. Run script loadstrall in MATLAB for a) loading diagnostic lib b) loading optimization lib c) loading infos about devices from Ini files.

4. Call command steeringmexfunction(22) in MATLAB to get info about steerers.

5. Choose 4 steerers from list by running following command in MATLAB SelectSteerers(ID_X1, ID_X2, ID_Y1, ID_Y2)

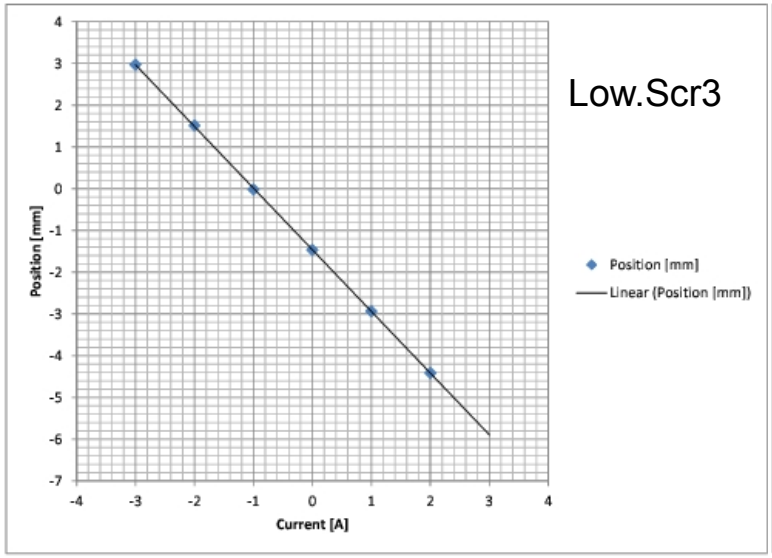
6. Call command steeringmexfunction(23) in MATLAB to get info about diagnostic devices (BPMs or Screens).

7. Choose 2 diagnostic devices (BPMs or screens) from list for monitoring bunch transverse position dependence on booster phase SelectBPMs(ID_1, ID_2)

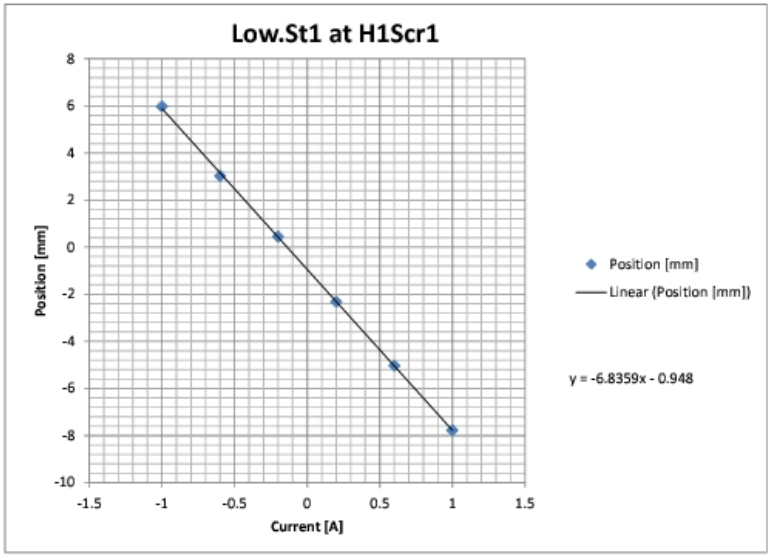
8. Run stroptimize4([-3 -3 -3 -3], [3 3 3 3], [0.5 0.5 0.5 0.5], [1 2 3 4; 5 6 7 8]) function or
   stroptimize2X([-3 -3], [3 3], [0.5 0.5], [1 2; 5 6]) function or
   stroptimize2Y([-3 -3], [3 3], [0.5 0.5], [1 2; 5 6]) function
   for 2D or 4D optimization

To be done

Strength = -7.98 mrad*MeV/c/A



Strength = -8.55 mrad*MeV/c/A



Logbook entries from 18.02 afternoon shift

1. During 18.02.2013 afternoon shift steerer strengths have been measured and some mismatch observed for LOW.ST1. The reason must be understood and corrected for accurate transportation of beam during steering.
2. Function for transferring phase-space coordinates to currents (written by Marek) must be tested.

Outlook

1. During next run steering functions can be tested, at least by using MATLAB interface.

2. Stand alone application is started to develop (is it needed?)