1910-work-v4

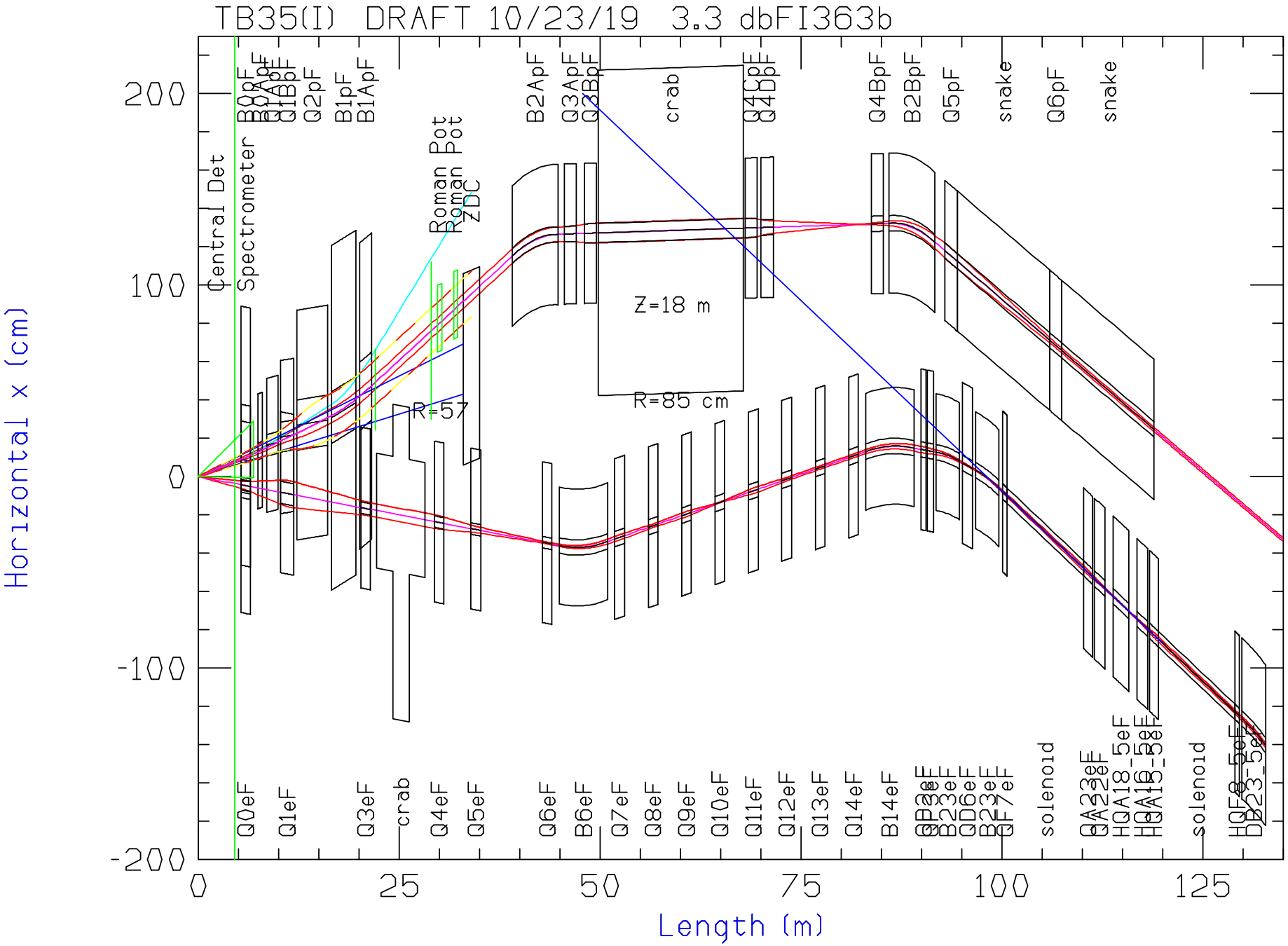
Baseline Forward Problems & possible fixes

10/25/2019

- Add in Layout:
  - Dimensions of warm electron quad yokes (from Holger)
  - Dimensions of RHIC cryostats where appropriate
  - 85 cm radial size of forward hadron crabs (from Qiong)
  - Revised dimensions of electron crab cryostat (from Qiong)
  - Show 18 m available length for forward hadron crabs

- Show layout and problems for baseline: Version (b)
- Suggest possible modification: Version (e)

Baseline (b) Layout



Problems

1. Electron crab interferes with neutron cone
2. Q3eF interferes with B1ApF
3. Zero degrees Calorimeter (ZDC) interferes with Q5eF
4. Limited sep. of neutral & charged beams at Roman pots
5. SR from B6eF hits crab aperture

Fixed by moving electron crab upstream by 5 m, requiring:

- Modified Q1eF, Q3eF, Q4eF, and Q5eF

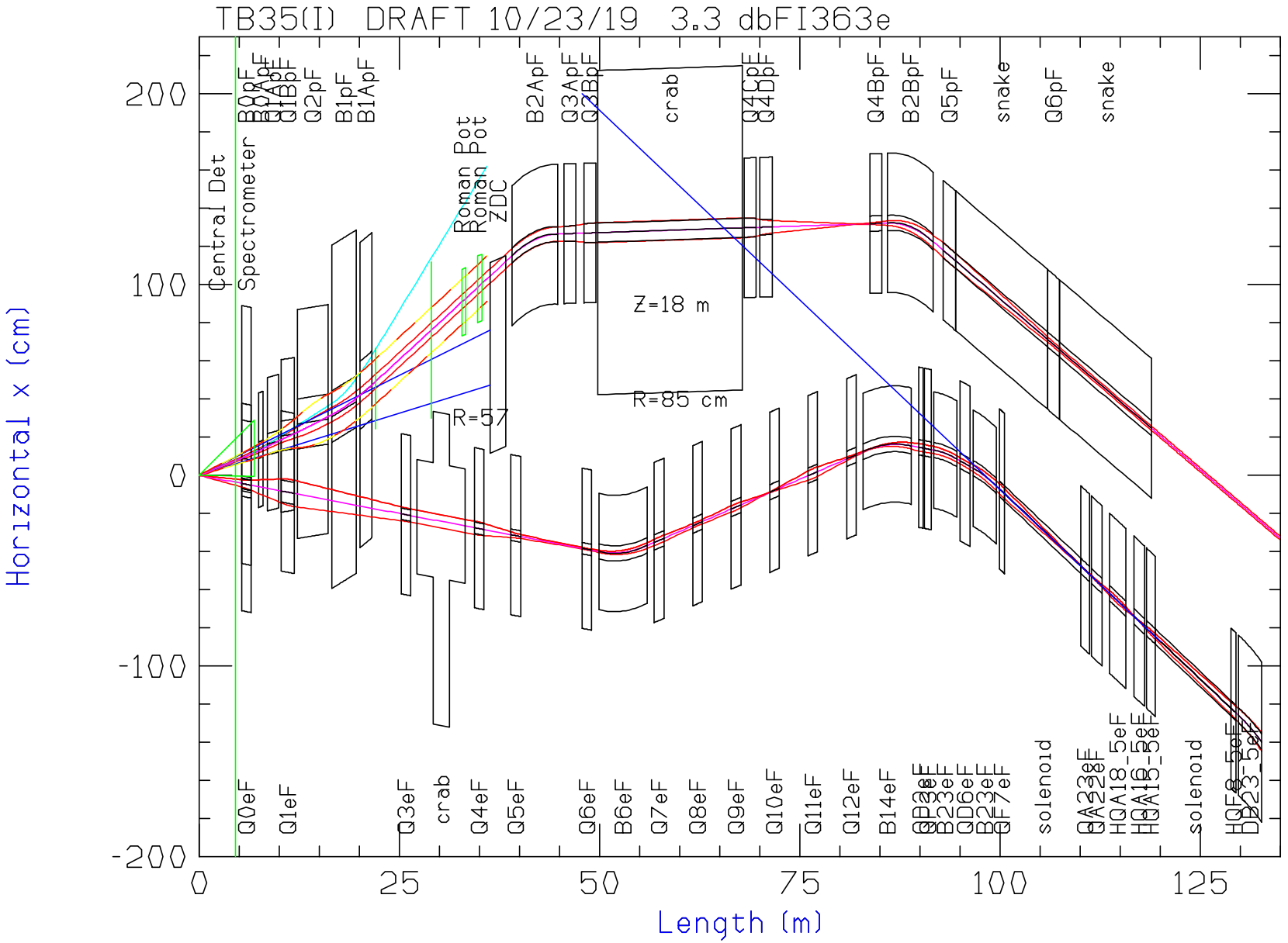
  For geometric match to ring

- $\approx$ 16% increaed fields in B6eF and B14eF
- Removing Q13eF and Q14eF and some quad spacing

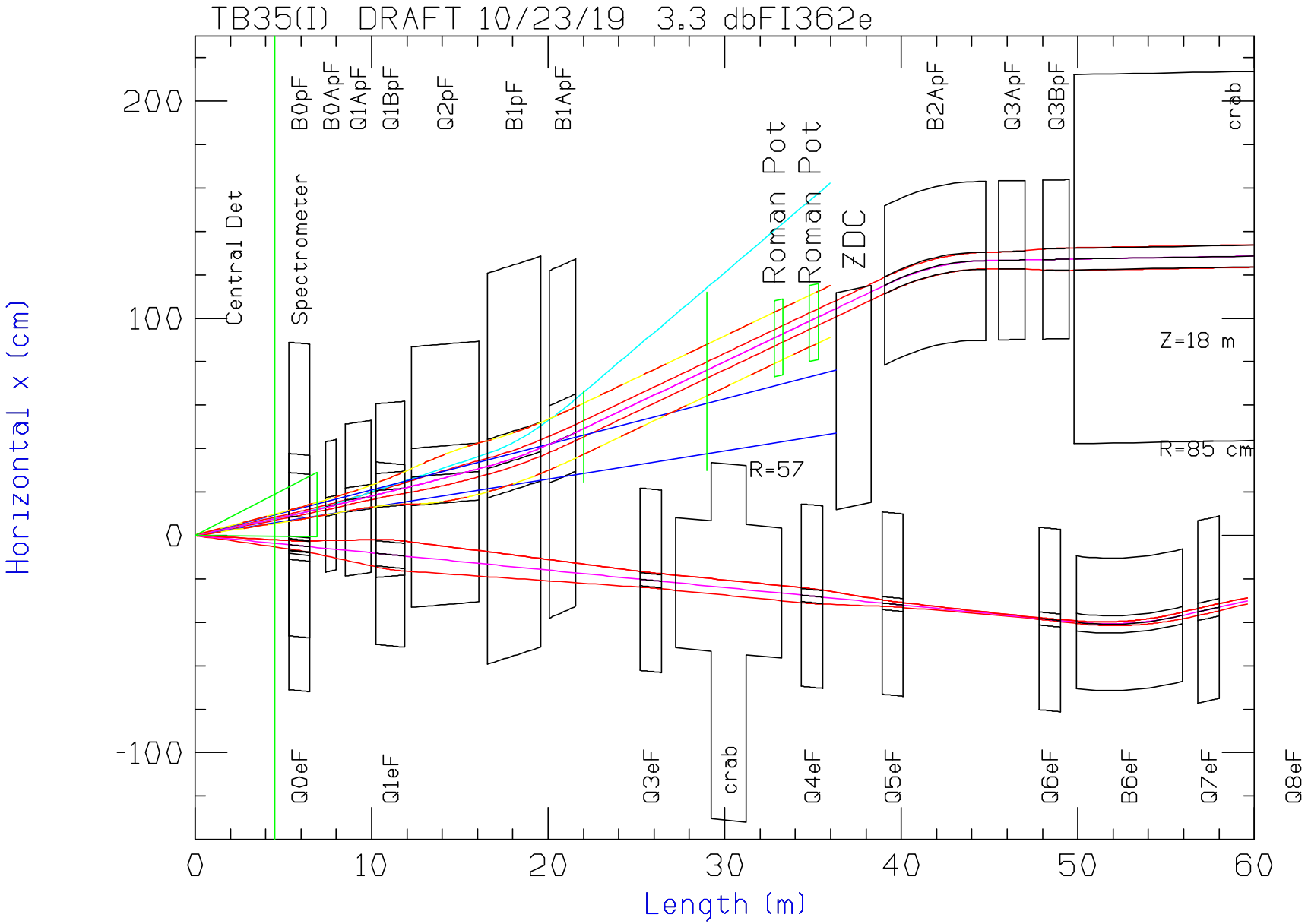
  Need beta & dispersion match to ring

- Beta Re-matching using quads beyond Q5eF (not done)

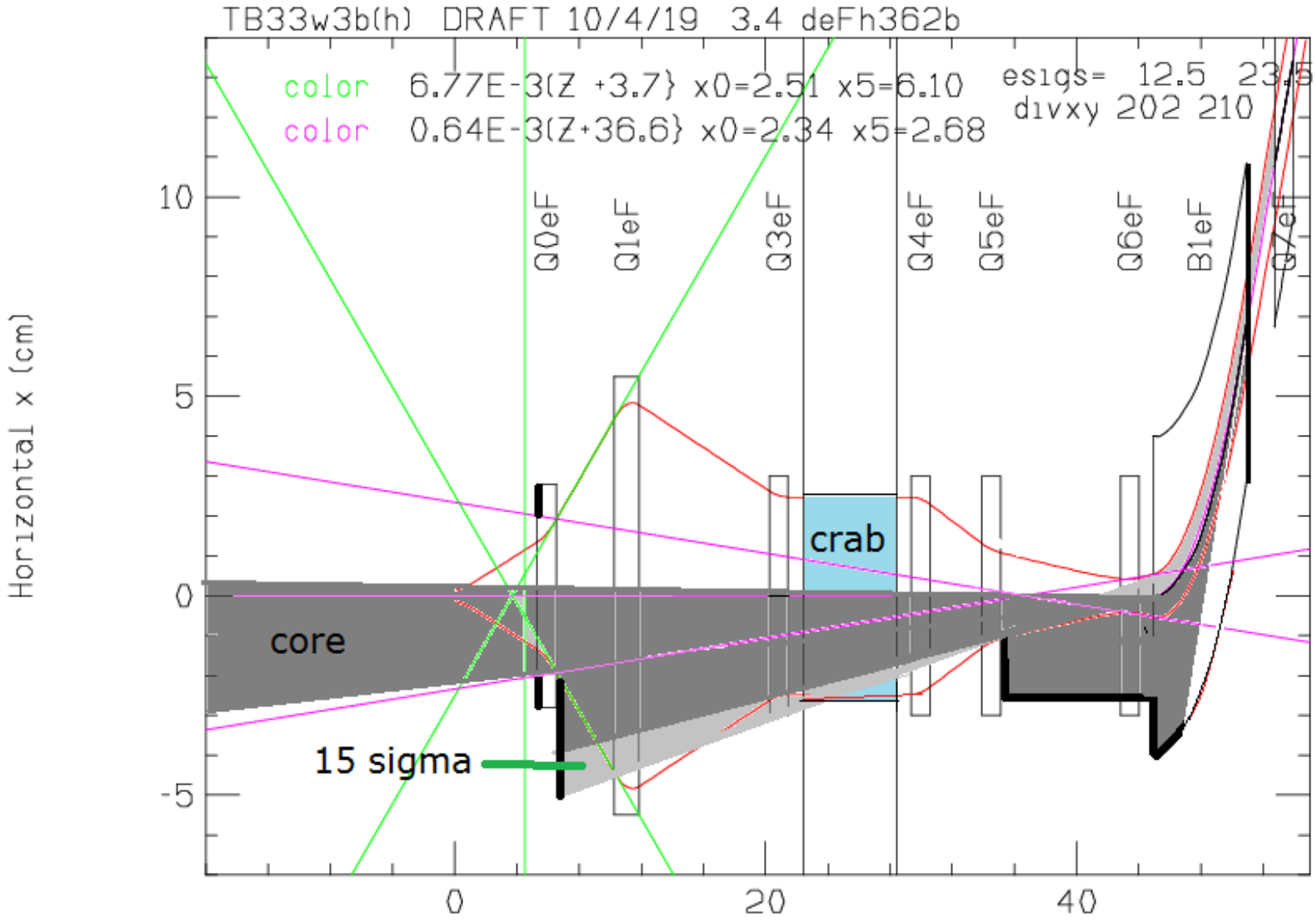
Version (e) with crab and B6eF moved 5 m



Detail of Version (e)

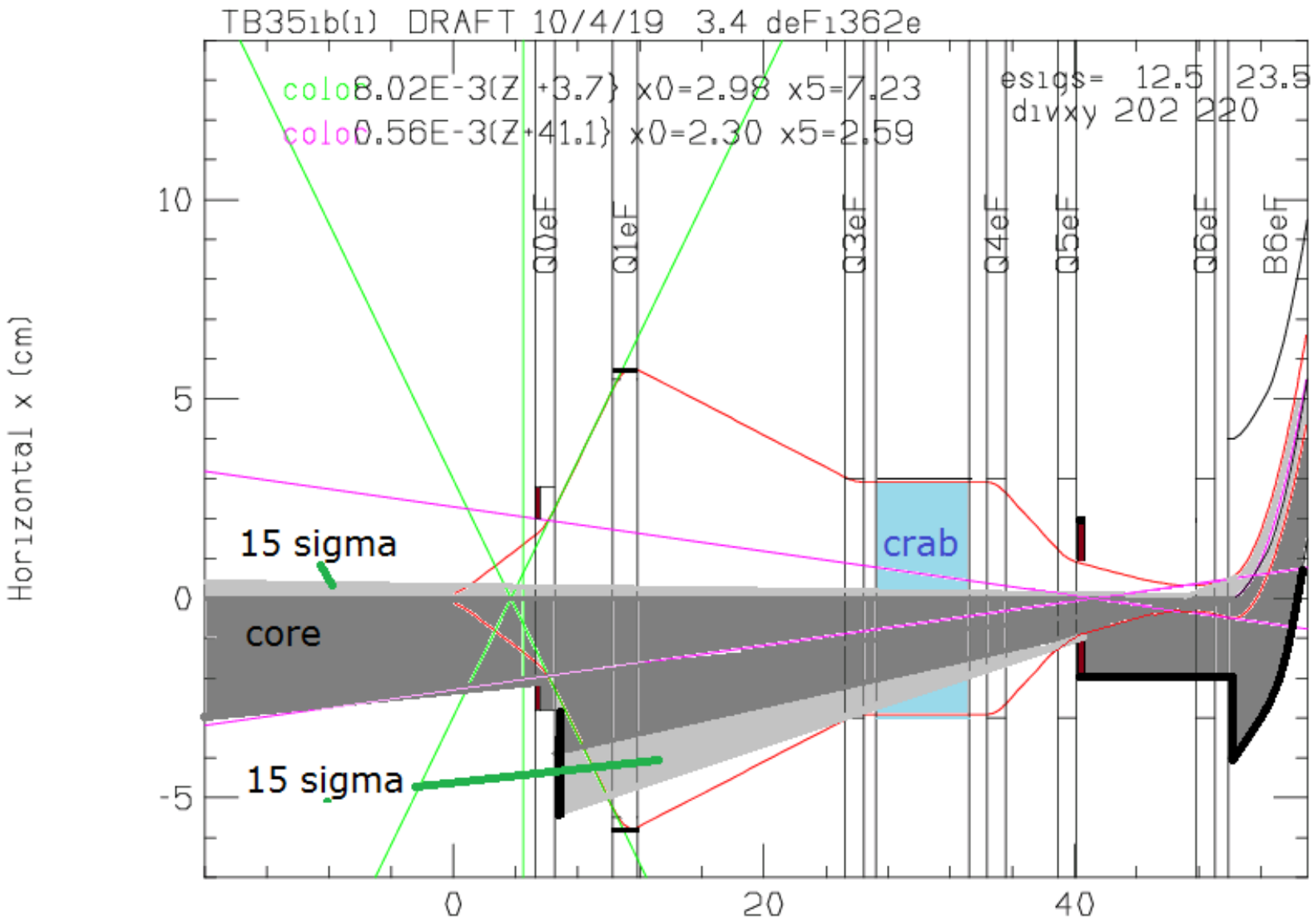


Baseline (b) SR from B6



Penumber of SR enters crab

Version (i) SR from B6

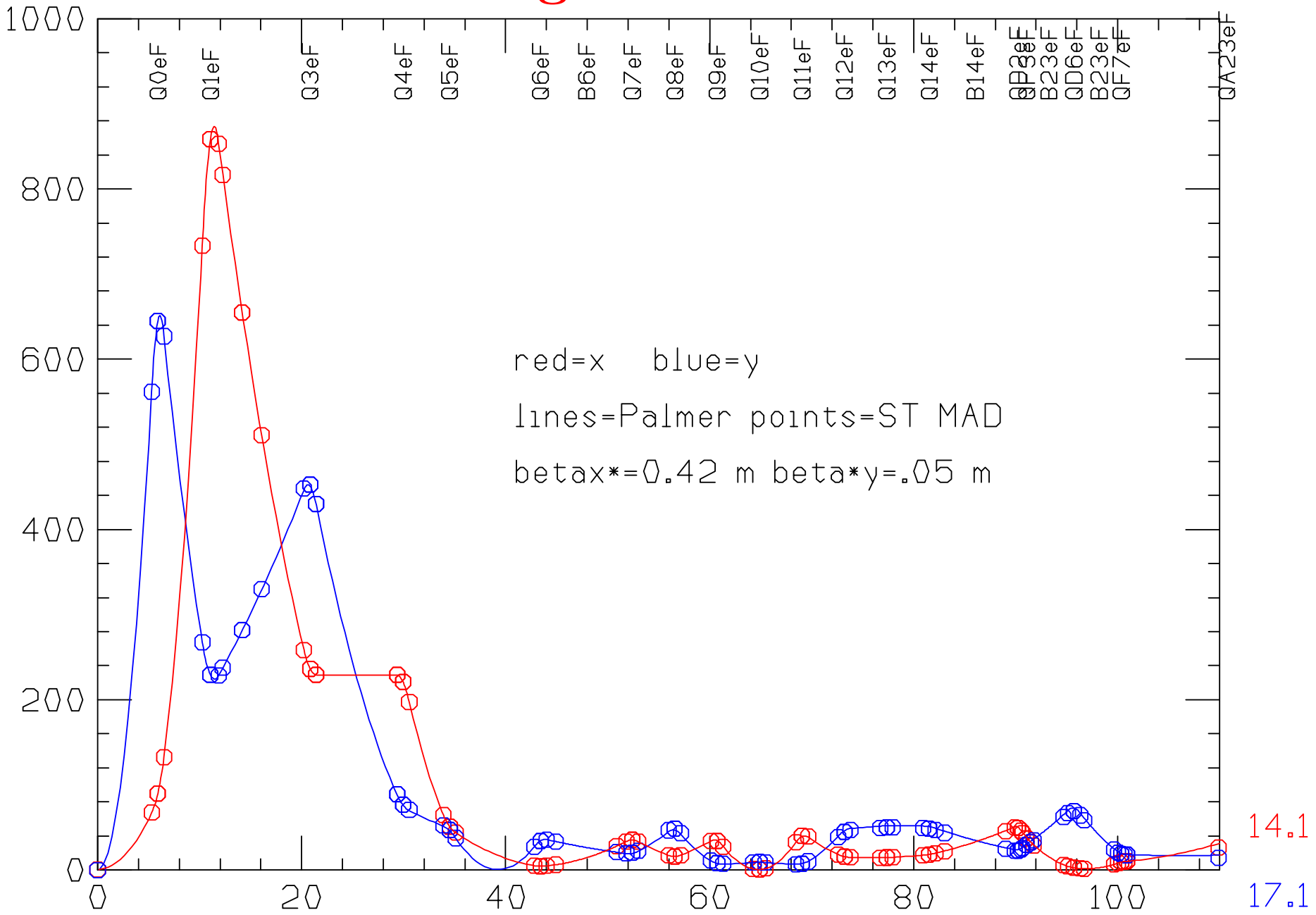


Stronger Q5eF focus after crab allows mask further in

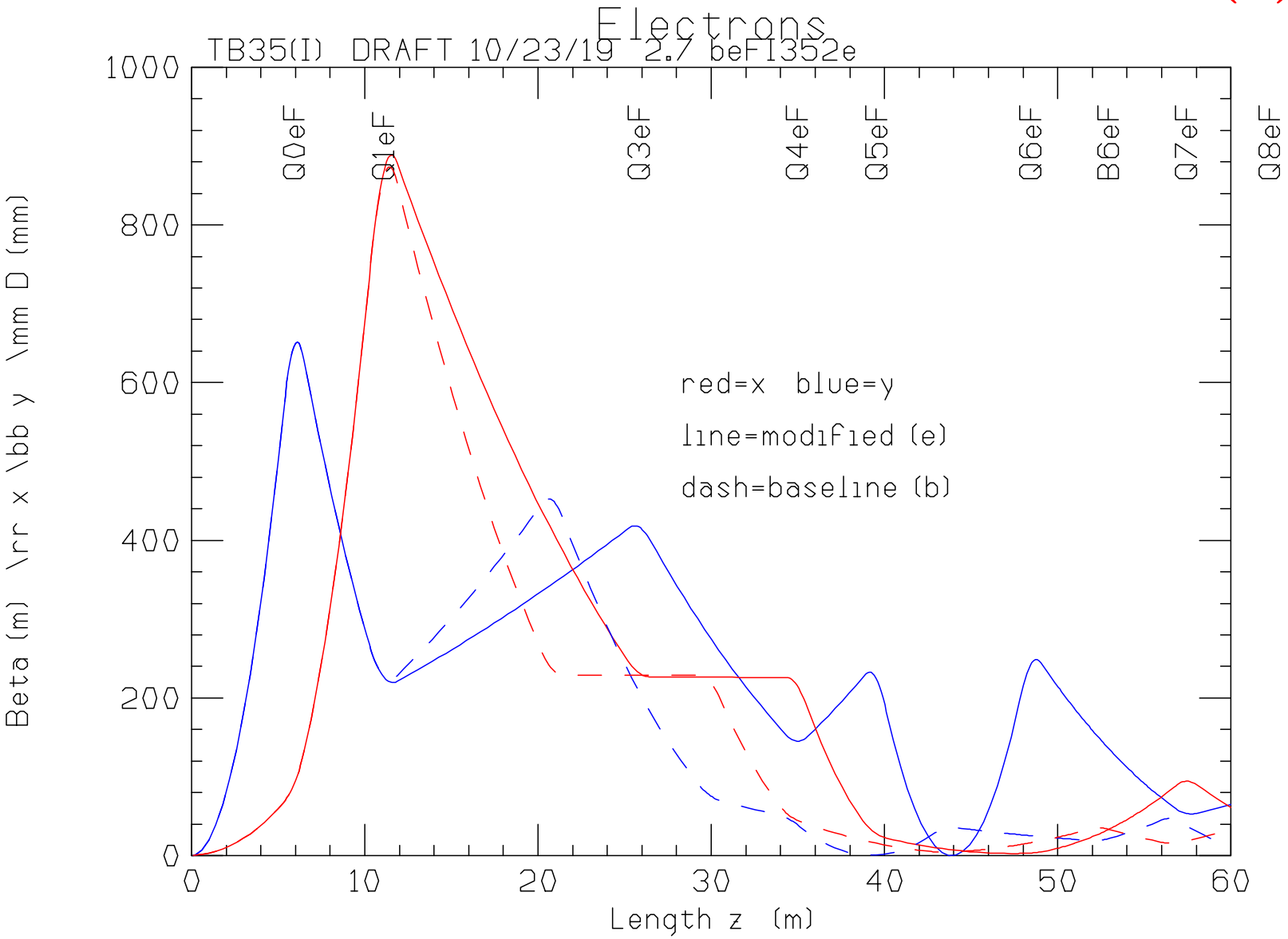
Comments

- It is assumed that some SR from the tails of the beam in the quads will enter and hit apertures in the Crab without enough power to cause trouble (as in cavities elsewhere)
- The above figure shows a 6 m long crab that includes 4 m of "stuff" that might have larger apertures and and less sensitivity to the radiation
- A longer distance between the crab and bend B6eF would help, and could be found if the dog leg bends was made steeper with stronger bends B6eF and B14eF. But this could make things worse.

Base-line betas using Palmer's and Steve's MAD



Betas for Baseline & Modified version (e)



Quadrupole strengths fixed Q0eF to Q4eF

All quads q5eF and above cab be used to match to ring

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# TB35ib(i)  DRAFT 10/23/19  zeFi353e Electron Forward  18
#
# beta*_x  beta*_y  gm emit_x gm emit_y  angle_x  angle_y    mom
#  [m]      [m]       [nm]     [nm]      [mrad]    [mrad]     GeV/c
 0.4200   0.0500     24.0000    2.4200      25       0         18
#
# name    center_z center_x rad1  rad2  length  angle     B      grad   ap x grad
#           [m]      [m]     {m}   [m]    [m]   [mrad]    [T]    [T/m]     [T]
  Q0eF    5.900  -0.1475  0.028  0.028   1.20   25.0   0.000   -13.531    -0.379
  Q1eF   11.065  -0.2766  0.058  0.058   1.61   25.0   0.000     6.648     0.386
  Q3eF   25.820  -0.6455  0.030  0.030   1.20   25.0   0.000    -3.400    -0.102
  Q4eF   34.950  -0.8738  0.030  0.030   1.20   25.0   0.000     7.500     0.225
  Q5eF   39.515  -0.9879  0.030  0.030   1.20   25.0   0.000   -15.000    -0.450
  Q6eF   48.415  -1.2104  0.030  0.030   1.20   25.0   0.000    -6.000    -0.180
  B6eF   52.915  -1.2827  0.040  0.040   6.00   38.4  -0.262     0.000     0.000
  Q7eF   57.415  -1.3173  0.040  0.040   1.20   51.2   0.000     9.252     0.370
  Q8eF   62.215  -1.3113  0.040  0.040   1.20   51.2   0.000   -13.205    -0.528
  Q9eF   67.015  -1.3054  0.040  0.040   1.20   51.2   0.000    18.172     0.727
  Q10eF   71.815  -1.2995  0.040  0.040   1.20   51.2   0.000    -6.493    -0.260
  Q11eF   76.615  -1.2936  0.040  0.040   1.20   51.2   0.000    17.824     0.713
  Q12eF   81.415  -1.2876  0.040  0.040   1.20   51.2   0.000    -7.441    -0.298
  B14eF   85.915  -1.3222  0.040  0.040   6.00   37.9   0.262     0.000     0.000
  QD2eF   90.115  -1.3871  0.040  0.040   0.60   25.0   0.000    23.109     0.924
  QF3eF   90.966  -1.4084  0.040  0.040   0.80   25.0   0.000    -2.800    -0.112
  B23eF   93.135  -1.4745  0.040  0.040   2.92   16.9   0.326     0.000     0.000
  QD6eF   95.604  -1.5637  0.040  0.040   1.20    9.1   0.000    -9.875    -0.395
  B23eF   98.074  -1.6766  0.040  0.040   2.92    1.0   0.326     0.000     0.000
  QF7eF  100.243  -1.7880  0.040  0.040   0.60   -6.8   0.000    19.599     0.784
  QA23eF  110.593  -2.3760  0.040  0.040   1.10   -6.8   0.000    28.364     1.135
  QA22eF  112.044  -2.4584  0.040  0.040   1.30   -6.8   0.000   -30.065    -1.203
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Conclusion

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