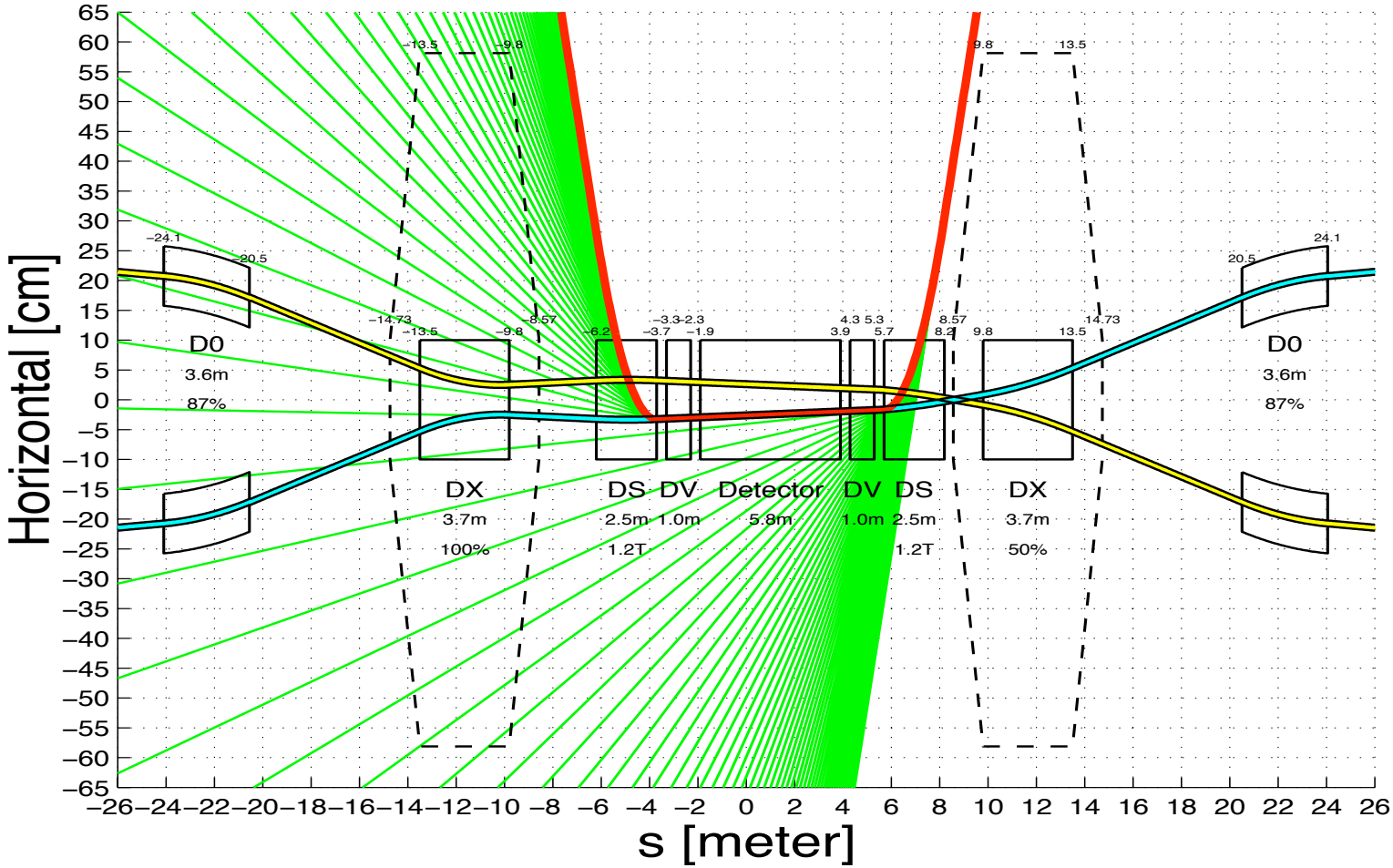
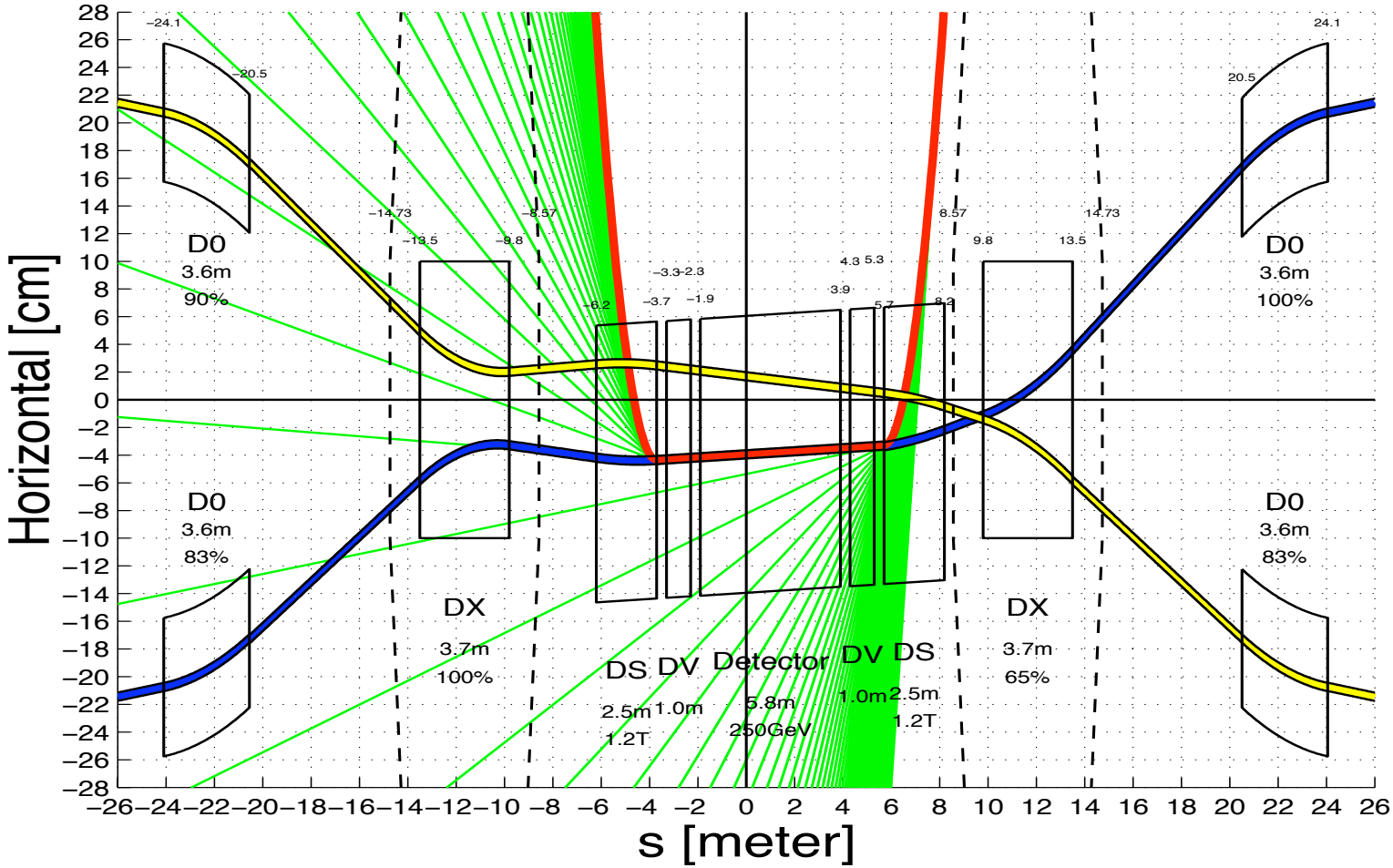
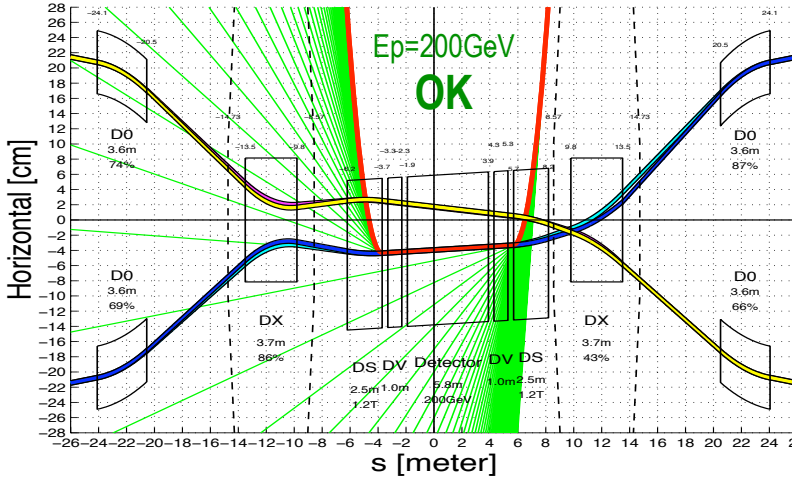
IR-layout Option #5
no add magnet, symmetric DO, tilt detector

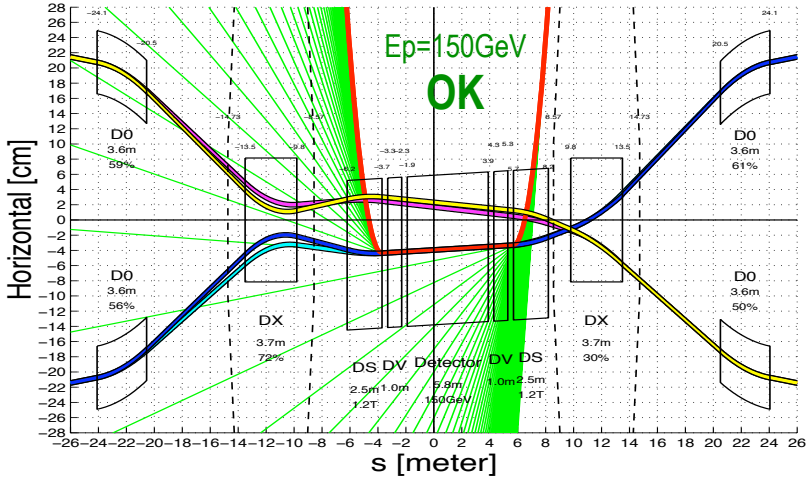


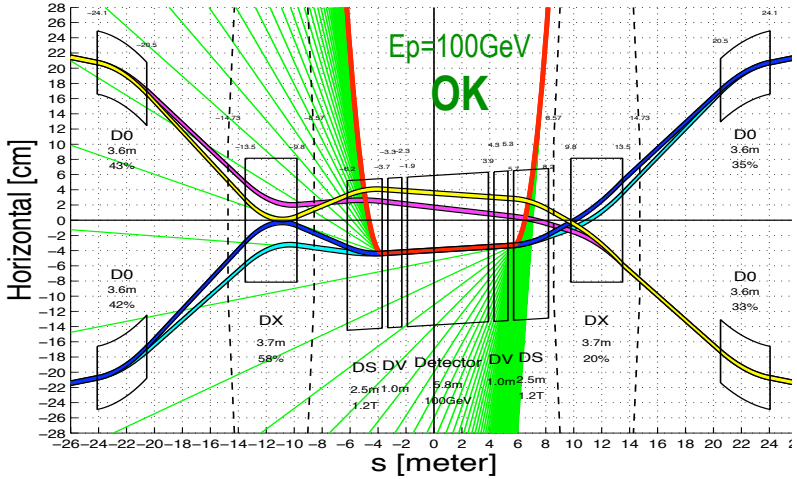
IR-layout Option #6
no add magnet, un-symmetric DO, tilt detector

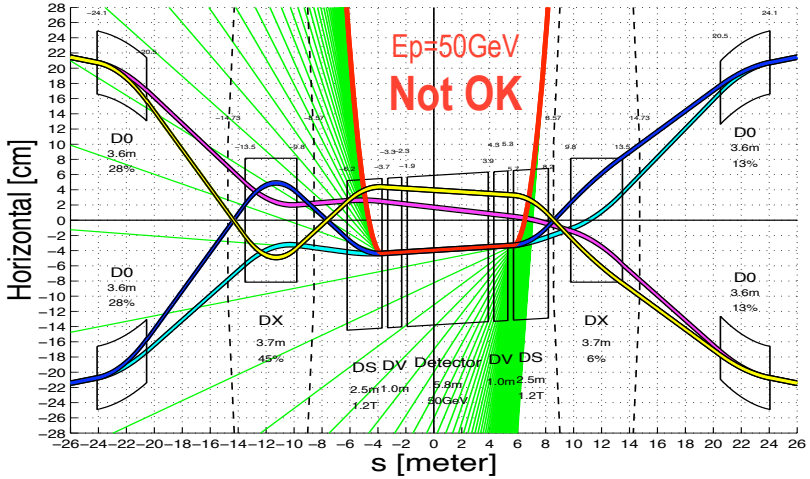


IR-layout Option #6
Proton energy tunability for a fixed e energy (4GeV)





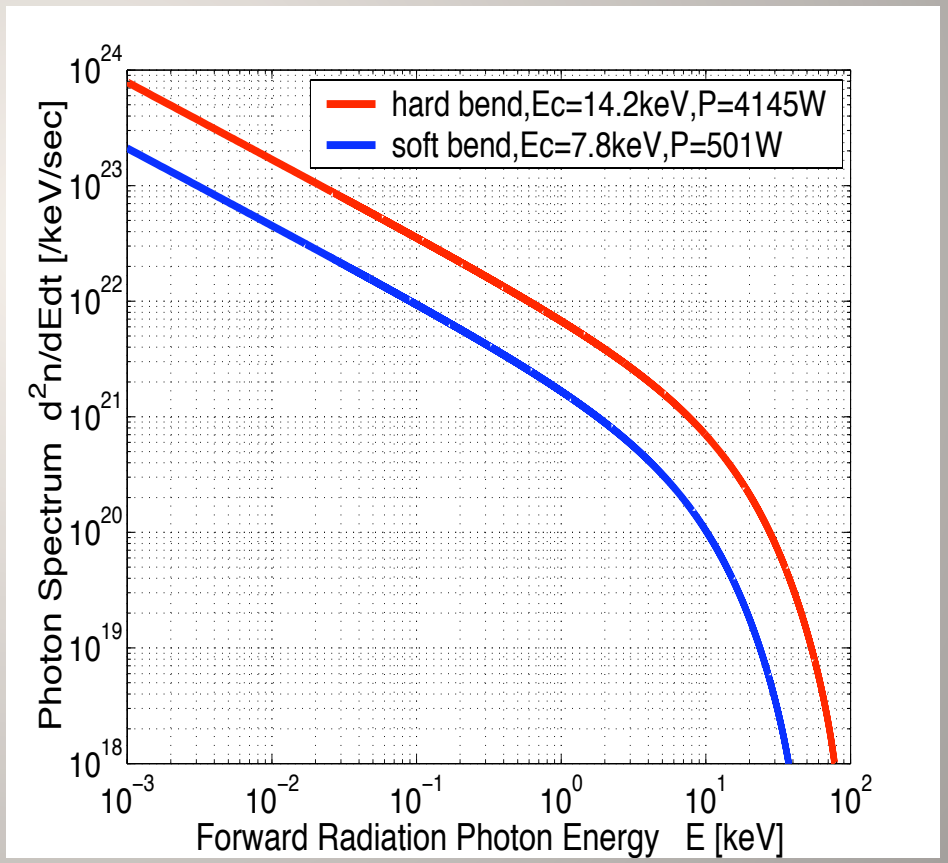




IR-layout Option #6
Detector Synchrotron Radiation Background

1. A horizontal hard bend and a vertical soft bend on both side of the detector;
2. The forward radiation from the up stream hard bend (red) is completely masked. No hard radiation passes through the detector;
3. The forward radiation from the up stream soft bend (blue) will pass through the detector without hitting detector wall.
4. The secondary backward radiation induced by the forward radiation generated in down stream bends will be largely masked from the detector;
5. The detector radiation background due to multiple scattering from the vacuum system, masks, collimators and absorbers will be investigated with computer simulations.

Forward Radiation Spectrum

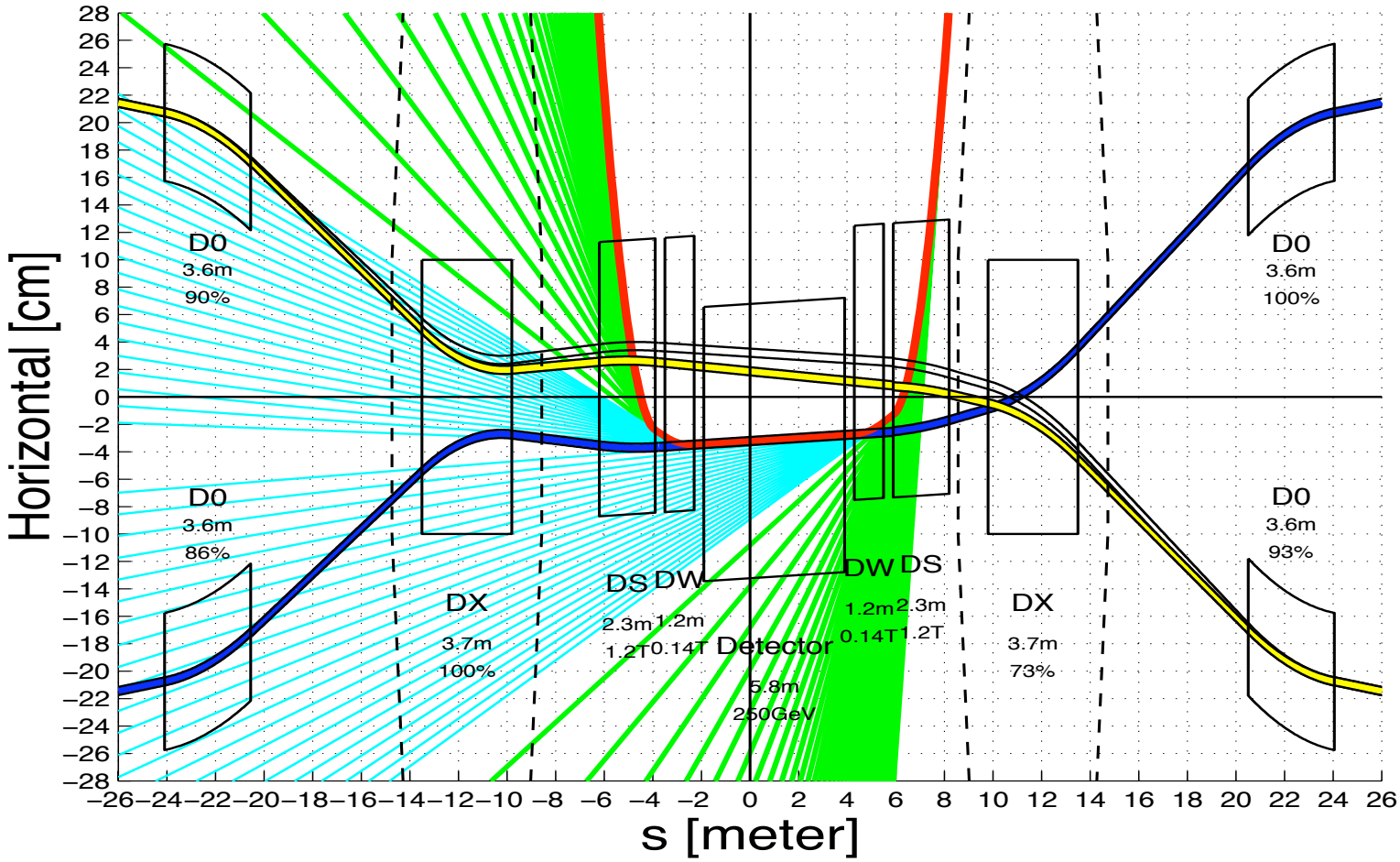


The related issues

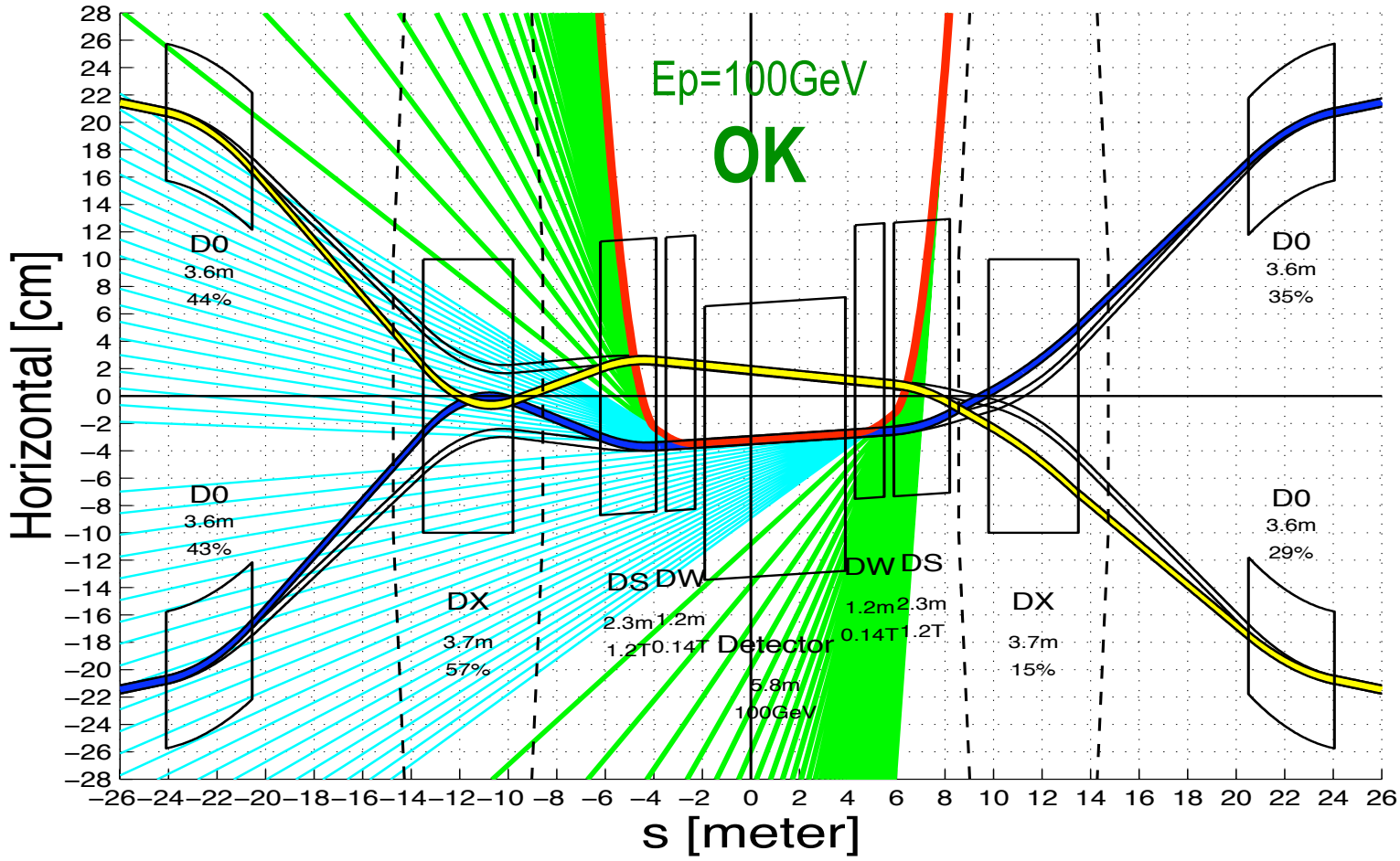
1. New small power supplies to enable to operate all 6 DXs and D0s at IR2 independently.
2. The IR needs a pipe with 8' OD (1/8 inch wall) to accommodate the three beams without overdriving DXs and D0s.
3. The electron bending angle in DV has to be 55mrad (0.66T) to avoid the SR generated in hard bends directly hitting the detector.
4. The two DV magnets bend proton beams by 0.8mrad vertically. The max. blue-yellow vertical separation is 7mm (in DVs).
5. The vertical bump generated by the DVs is not closed. It could be possible to close the bump with the vertical collectors (25-30m away). Needs investigations.
6. The impact of the vertical bump on polarization.

IR-layout Option #7 (horizontal soft bending)

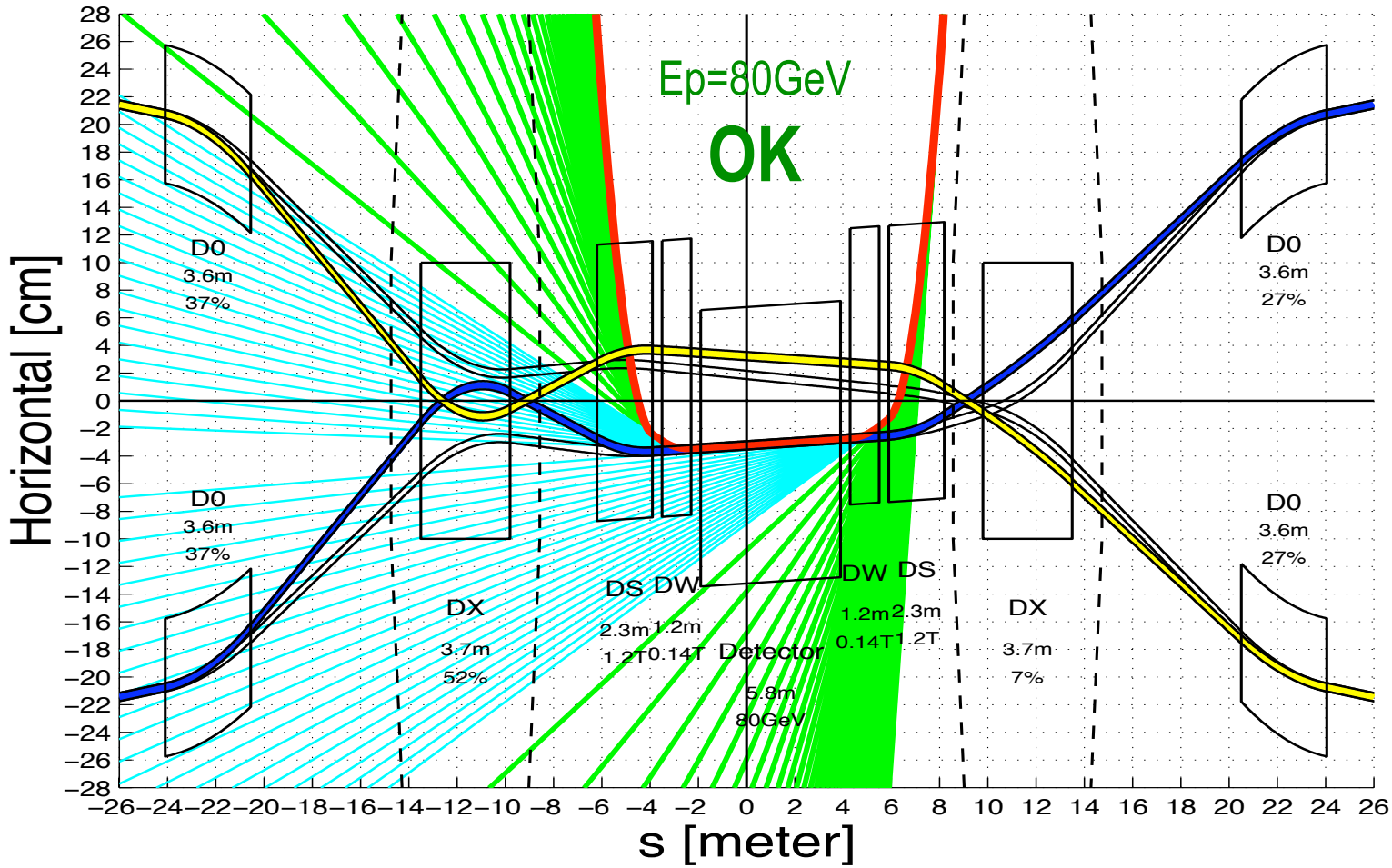
no add magnet, un-symmetric D0, tilt detector



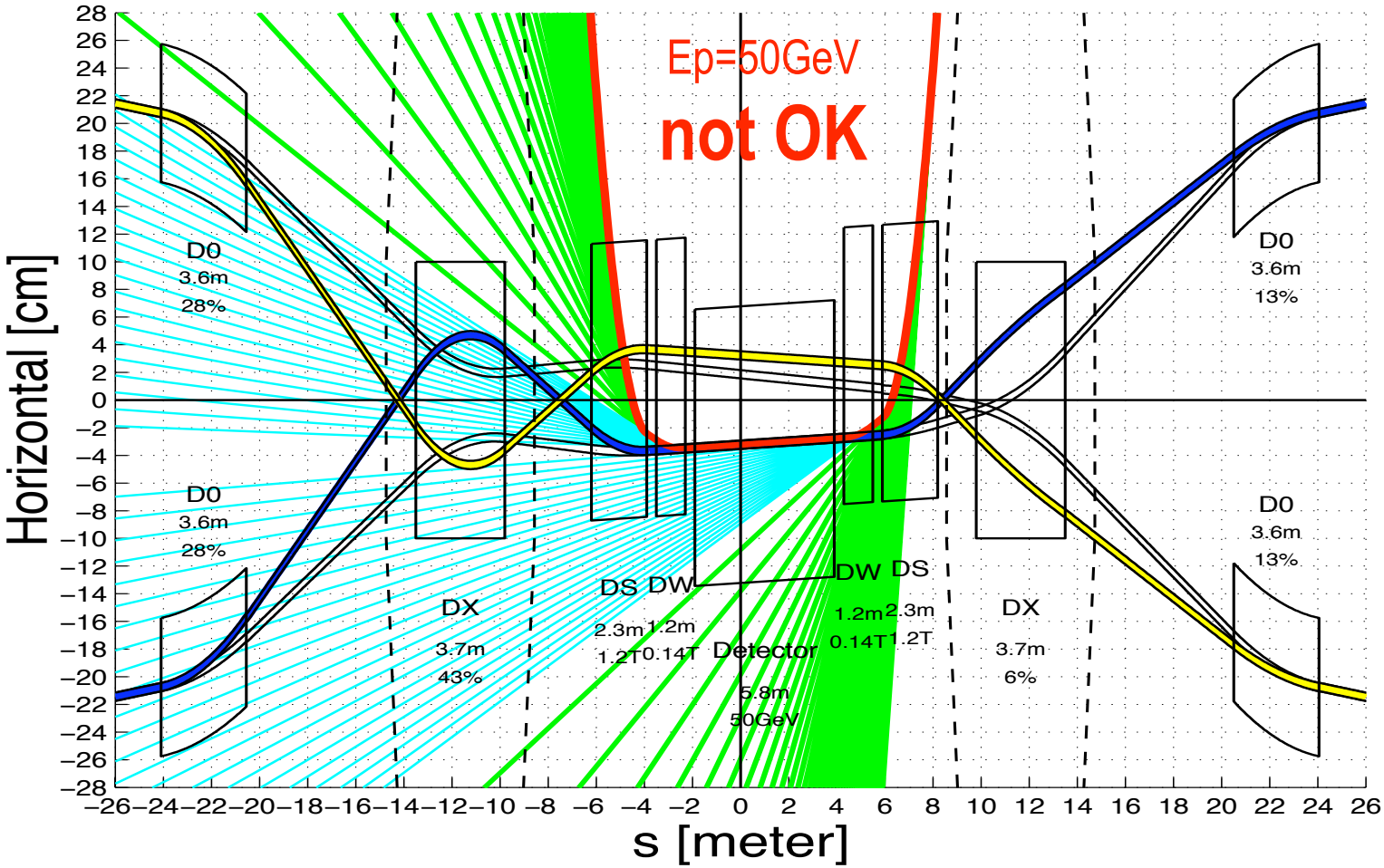
IR-layout Option #7 (horizontal soft bending)
Proton energy tunability for a fixed e energy (4GeV)



IR-layout Option #7 (horizontal soft bending)
Proton energy tunability for a fixed e energy (4GeV)



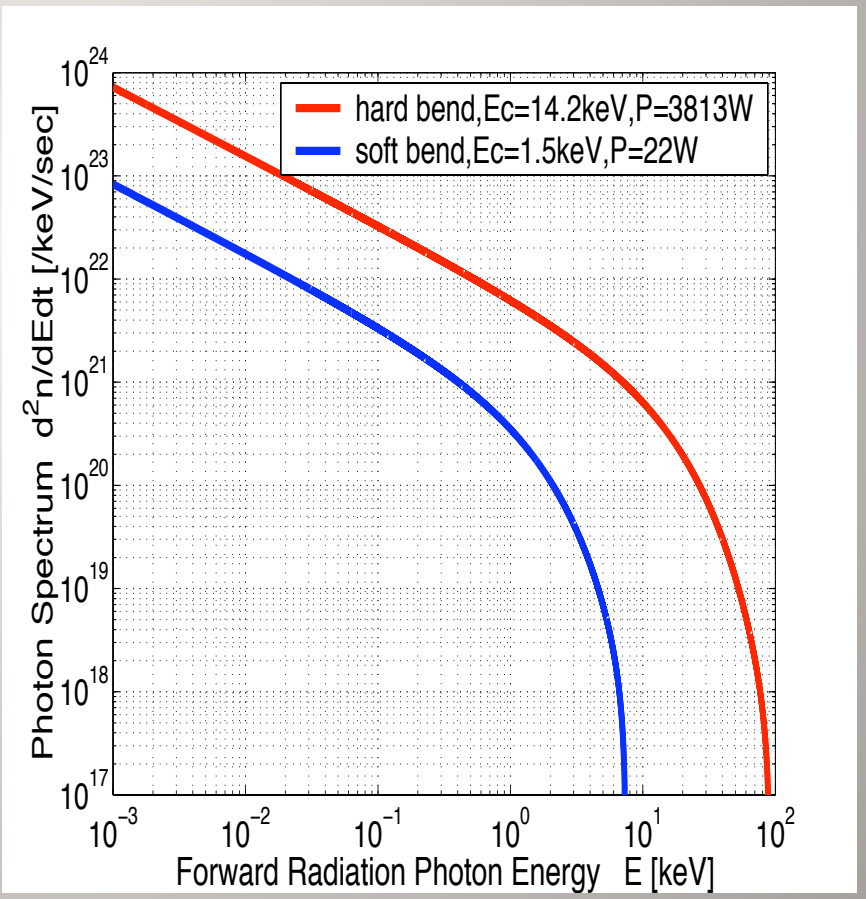
IR-layout Option #7 (horizontal soft bending)
Proton energy tunability for a fixed e energy (4GeV)



IR-layout Option #7 (horizontal soft bending) Detector Synchrotron Radiation Background

1. A horizontal hard bend and a horizontal soft bend on both side of the detector;
2. The forward radiation from the up stream hard bend (red) is completely masked. No hard radiation passes through the detector;
3. The forward radiation from the up stream soft bend (blue) will pass through the detector without hitting detector wall.
4. The secondary backward radiation induced by the forward radiation generated in down stream bends will be largely masked from the detector;
5. The detector radiation background due to multiple scattering from the vacuum system, masks, collimators and absorbers will be investigated with computer simulations.

Forward Radiation Spectrum



Choice of Materials

SR absorbers/masks for IR and arcs: Glidcop (Copper based)

Secondary photon energy: 9keV

Electron beam lines: Aluminum

Complicated shape to accommodate absorbers/masks, vacuum pumps, water cooling…

Secondary photon energy: 1keV

Experimental beam pipe (EBP): Beryllium and/or Aluminum

Secondary photon energy: 0.1keV

Experiment	~~BRAHMS~~	STAR	PHENIX	~~PHOBOS~~	MeRHIC
Interaction region #	2	6	8	10	2
DX flange ends [m]	2 x 8.615	2 x 8.615	2 x 8.615	2 x 8.615	2 x 8.615
EBP length [m]	7.1	8	5.2	12	5.8
EBP material	Beryllium	Beryllium	Beryllium	Beryllium	Beryllium
Extension material	Aluminum	Aluminum	SS	None	Aluminum
Flange	Al Conflat	Al Conflat	SS Conflat	Be Conflat	Al Conflat
Be pipe length [m]	1.5	1.5	1.5	3 x 4	6
Be pipe I.D. [cm]	7.4 (3″)	7.4 (3″)	7.4 (3″)	7.4 (3″)	20 (8″)
Be thickness [mm]	1	1	1	1	3 (1/8 inch)

Summary

1. There is a suitable IR design to keep DX magnets even though the space is very limited.
2. To accommodate the three beams without overdriving DXs and D0s the separation of blue and yellow beams has to be 6-7cm at the detector. So:
   a) Needs a pipe with 8' OD (1/8 inch wall)
   b) or consider separate pipes for blue-electron and yellow beam.
3. The effect of detector solenoid field on the off-centered yellow beam is a kick of ~0.3mrad which can be easily corrected.
4. The forward radiation from the up stream hard bend is completely masked. The forward soft radiation has power of 22W with Ec=1.5keV.
5. Need new small power supplies to enable operating all 6 DXs and D0s at IR2 independently.