In[1]:= `<< im_solver.m`

Matched Envelope Solution -- IM Method

3-5-2015 by lund on localhost

Code Provided by Steve Lund

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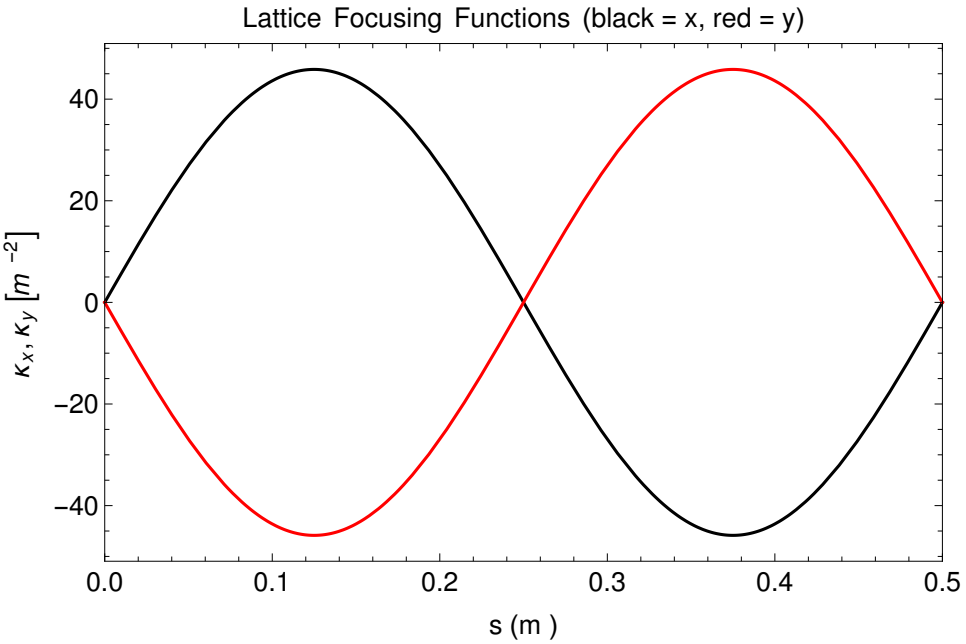
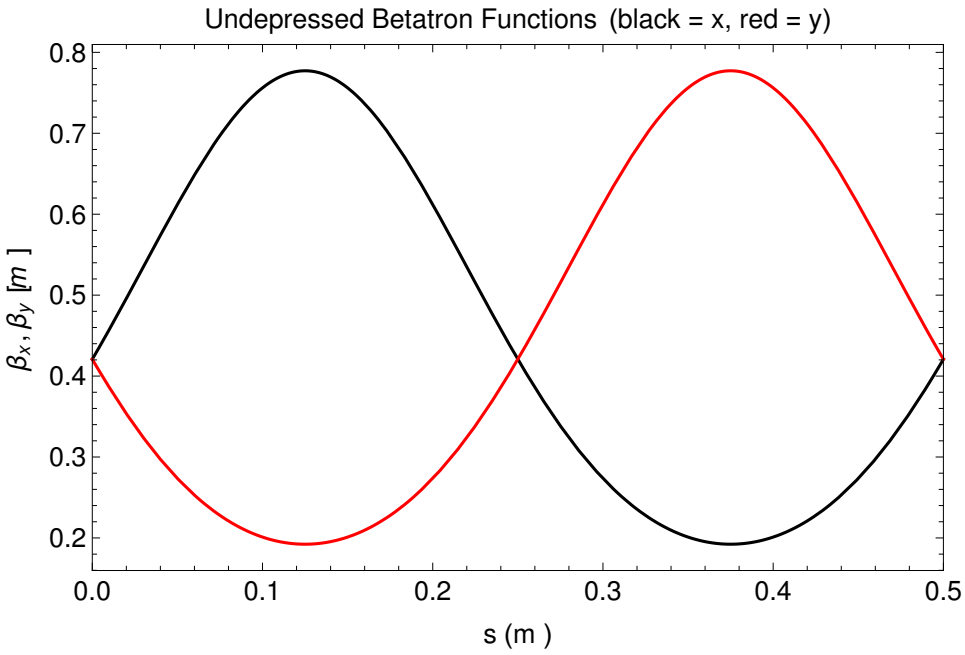
Transport Lattice

Lattice Type	UserInput
Undepressed Phase Advances [deg/period]	
x-plane, σ_{0x} [deg/period]	80.
y-plane, σ_{0y} [deg/period]	80.
Lattice Period, L_p [m]	0.5
Occupancy, η	NA
Syncopation Factor, α ($\alpha = 1/2 \Rightarrow$ FODO)	NA
Max Focusing Strength, Max[κ_x, κ_y], [1/m ^{2}]	45.853



Undepressed (Lattice) Betatron Function

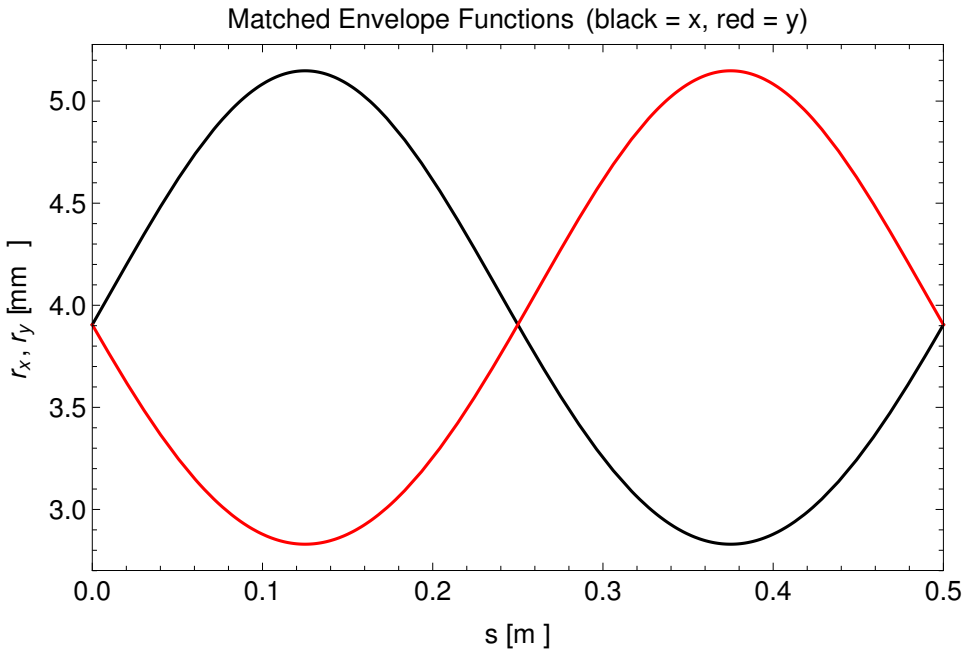


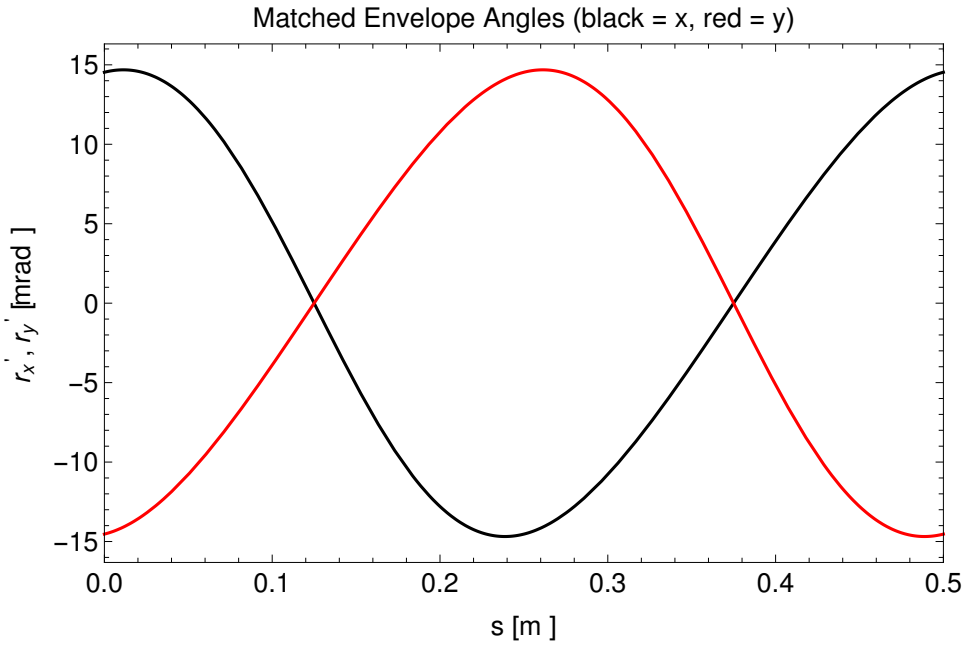
	x-Horizontal	y-Vertical
Max[β_x], Max[β_y] [m]	0.77721	0.77721
s-locations of Maxs [mm]	125.	375.
Min[β_x], Min[β_y] [m]	0.19226	0.19226
s-locations of Mins [mm]	375.	125.

Beam Properties

Dimensionless Perveance, Q	$1.\times10^{-4}$
RMS Edge Emittances [mm -mrad]:	
ε_x	7.6221
ε_y	7.6221
Depressed Phase Advances [deg/period]	
x-plane, σ_x [deg/period]	16.
y-plane, σ_y [deg/period]	16.
Tune Depressions:	
σ_x / σ_{0x}	0.2
σ_y / σ_{0y}	0.2

Matched Solution





	x-Horizontal	y-Vertical
Radii, $r_x = 2\langle x^2\rangle^{1/2}$, $r_y = 2\langle y^2\rangle^{1/2}$:		
Avg (Lattice Period), $\overline{r_x}$, $\overline{r_y}$ [mm]	3.947	3.947
Max, Max[r_x], Max[r_y] [mm]	5.1485	5.1485
s-locations of Maxs [mm]	125.	375.
Min, Min[r_x], Min[r_y] [mm]	2.8298	2.8298
s-locations of Mins [mm]	375.	125.
Angles, r_x', r_y' :		
Max, Max[r_x'], Max[r_y'] [mrad]	14.685	14.685
s-locations of Maxs [mm]	11.317	261.32
Min, Min[r_x'], Min[r_y'] [mrad]	-14.685	-14.685
s-locations of Mins [mm]	238.66	488.67
Matching Conditions:		
Radii, $r_x[0]$, $r_y[0]$ [mm]	3.9049	3.9049
Angles, $r_x'[0]$, $r_y'[0]$ [mrad]	14.533	-14.533

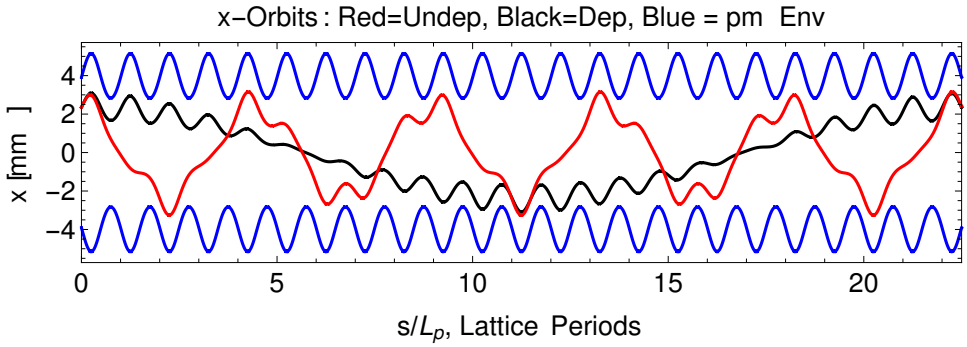
Average Radius Measures:	
$\sqrt{\overline{r_x}\,\overline{r_y}}$ [mm]	3.8612
$(\overline{r_x}+\overline{r_y})/2$ [mm]	3.947

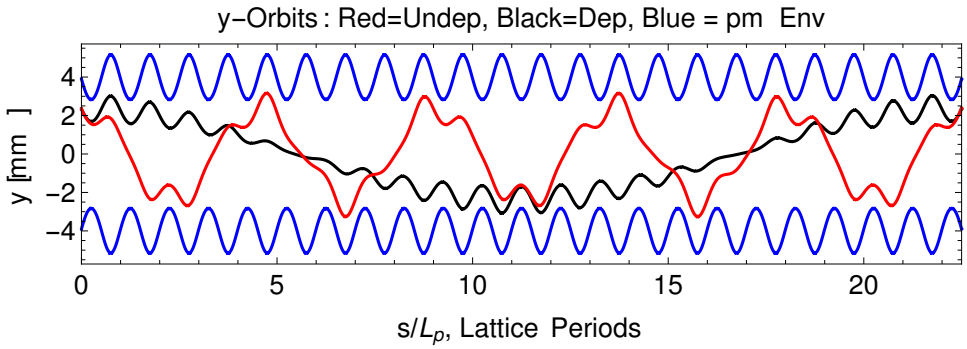
Matched Solution -- Numerical Parameters

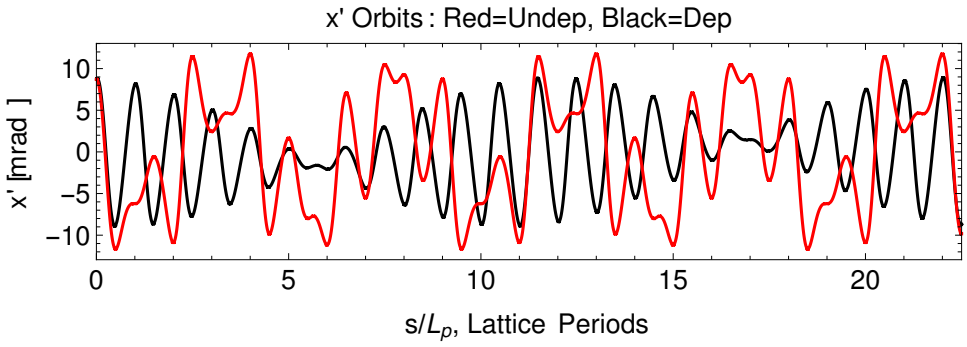
Parameterization Case	1
Specified Fractional Tolerance	$1.\times10^{-6}$
Achieved Fractional Tolerance	2.6884×10^{-7}
Iterations Needed	7
CPU Time for Solution [sec]	15.9765

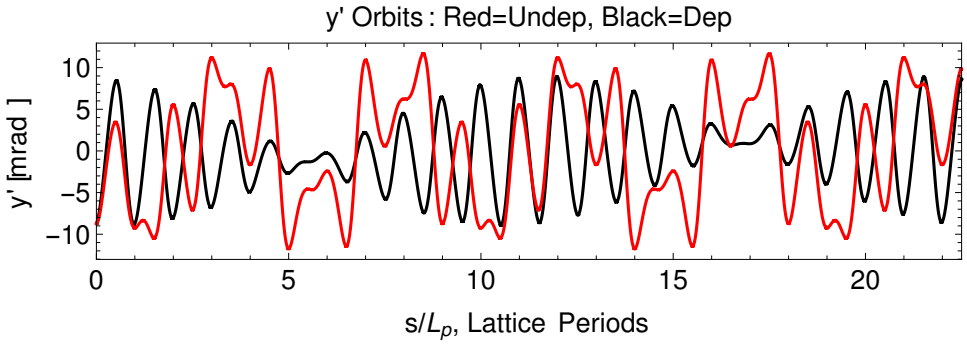
Characteristic x- and y-Plane Orbits

Single Particle CS Invariants (includes space-charge):	
ϵ_x [mm -mrad]	2.744
ϵ_y [mm -mrad]	2.744
Axial Coordinates:	
Initial s_i [m]	0.
Final s_f [m]	11.25
Initial Conditions, Undep and Dep	
x-plane	
x[s_i] [mm]	2.343
x'[s_i] [mrad]	8.7197
y-plane	
y[s_i] [mm]	2.343
y'[s_i] [mrad]	-8.7197
Final Conditions, Undepressed	
x-plane	
x[s_f] [mm]	2.3979
x'[s_f] [mrad]	-9.8395
y-plane	
y[s_f] [mm]	2.3977
y'[s_f] [mrad]	9.839
Final Conditions, Depressed	
x-plane	
x[s_f] [mm]	2.34
x'[s_f] [mrad]	-8.6489
y-plane	
y[s_f] [mm]	2.3398
y'[s_f] [mrad]	8.6484


x−Orbits : Red=Undep, Black=Dep, Blue = pm Env
x [mm]
4
2
0
−2
−4
0
5
10
15
20
s/L_p, Lattice Periods


y−Orbits : Red=Undep, Black=Dep, Blue = pm Env
y [mm]
4
2
0
−2
−4
0
5
10
15
20
s/L_p, Lattice Periods


x' Orbits : Red=Undep, Black=Dep
x' [mrad]
10
5
0
−5
−10
0
5
10
15
20
s/L_p, Lattice Periods


y' Orbits : Red=Undep, Black=Dep
y' [mrad]
10
5
0
−5
−10
0
5
10
15
20
s/L_p, Lattice Periods

Envelope Linear Stability

Continuous Limit Mode Phase Advances:
(x-y plane averages)

σ_+ [deg/period]	115.38	
σ_- [deg/period]	84.664	

Linear Eigenvalues {|λ|,Arg[λ]} {[1],[deg]}:

λ_1	1.	116.29
λ_2	1.	-116.29
λ_3	1.	87.494
λ_4	1.	-87.494

Mode Symmetry [Lund and Bukh, PRSTAB (2004)]: Class A

Eigen Modes:

Mode 1:	
σ_1 [deg/period]	{272.51, 243.71, 116.29, 87.494}
γ_1	1
Mode 2:	
σ_2 [deg/period]	{272.51, 243.71, 116.29, 87.494}
γ_2	1

Linear Perturbation Eigenvalues