Laser Beam Recirculation with Crystals For Laser Stripping

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Talk outline

- **RING concept**
- **RING scheme approach for laser stripping**
- **Simulation**
- **Conclusion**

Recirculation Injection by Nonlinear Gating of laser pulse trapping scheme

Proceedings of PAC07, Albuquerque, New Mexico, USA TUPMS031

HIGH-ENERGY PICOSECOND LASER PULSE RECIRCULATION FOR COMPTON SCATTERING*

I. Jovanovic, S. G. Anderson, S. M. Betts, C. Brown, D. J. Gibson,
F. V. Hartemann, J. E. Hernandez, M. Johnson, D. P. McNabb, M. Messerly,
J. Pruet, M. Y. Shverdin†, A. M. Tremaine, C. W. Siders, C. P. J. Barty
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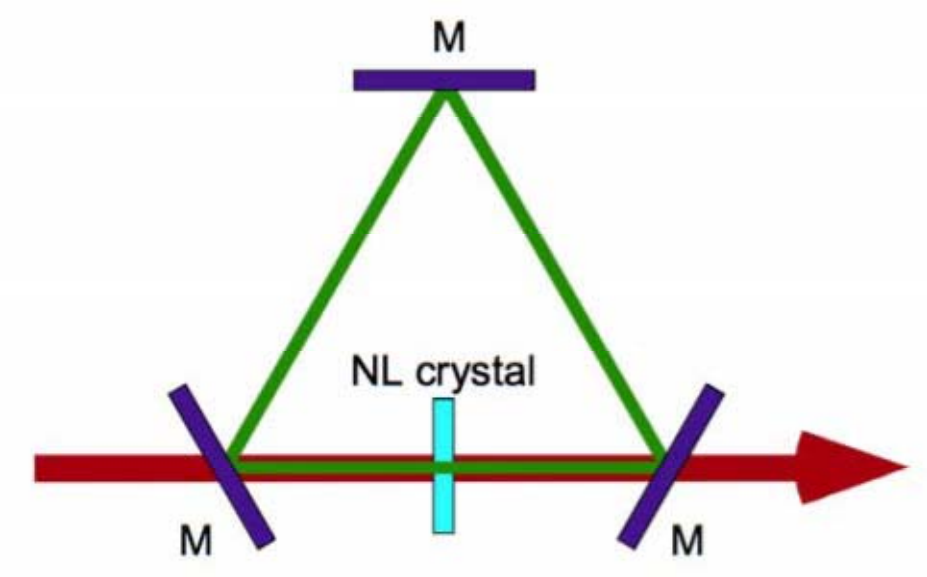
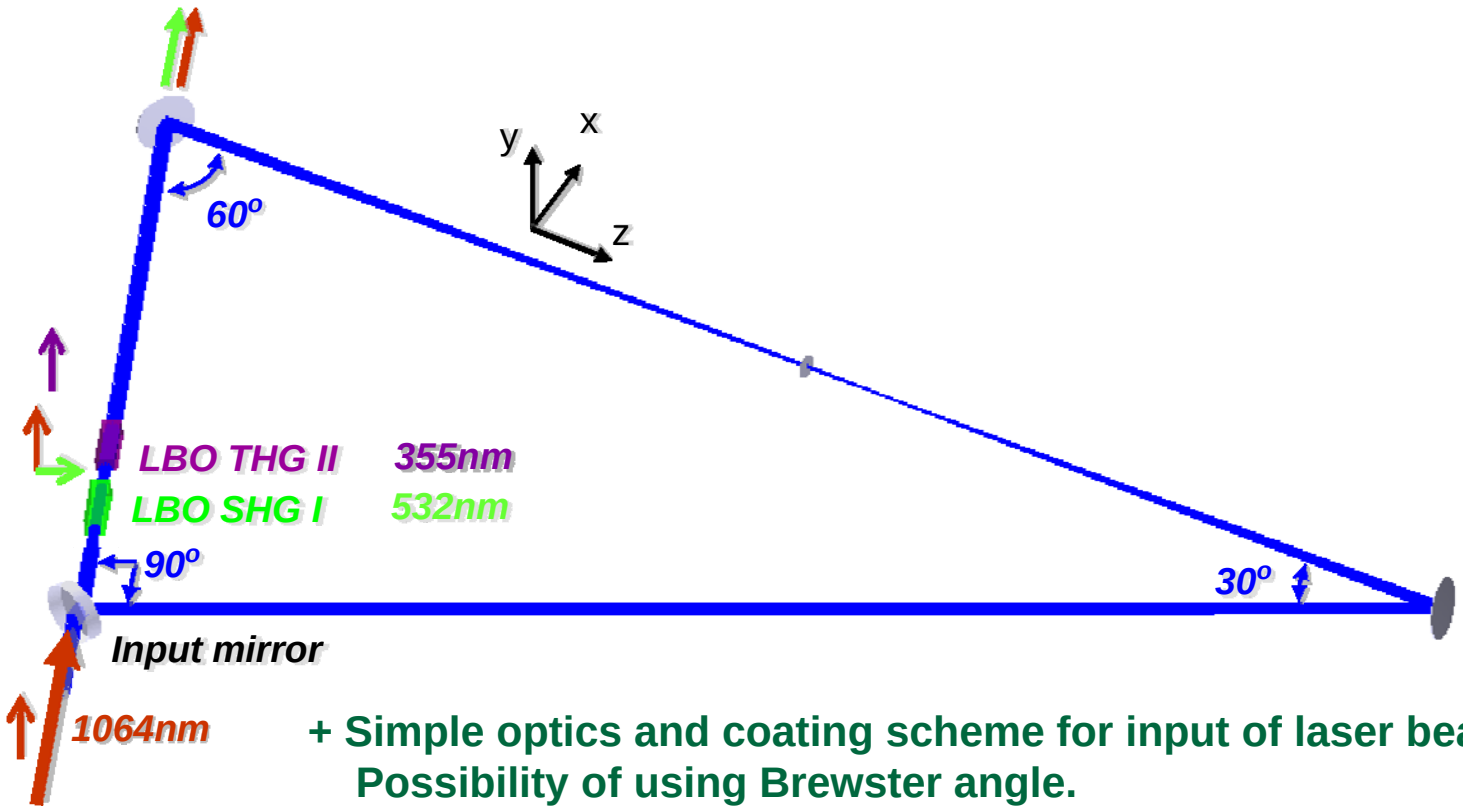
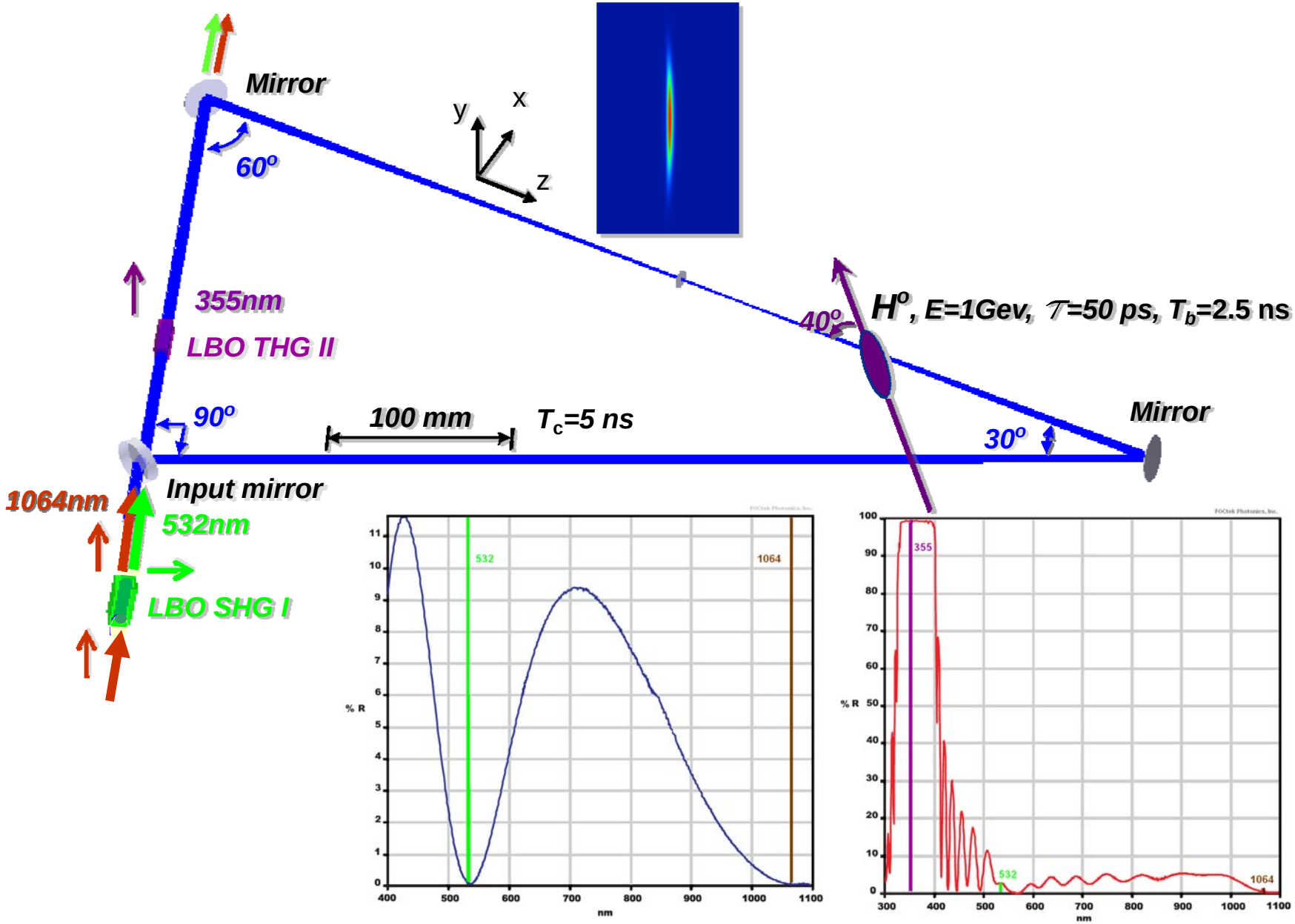


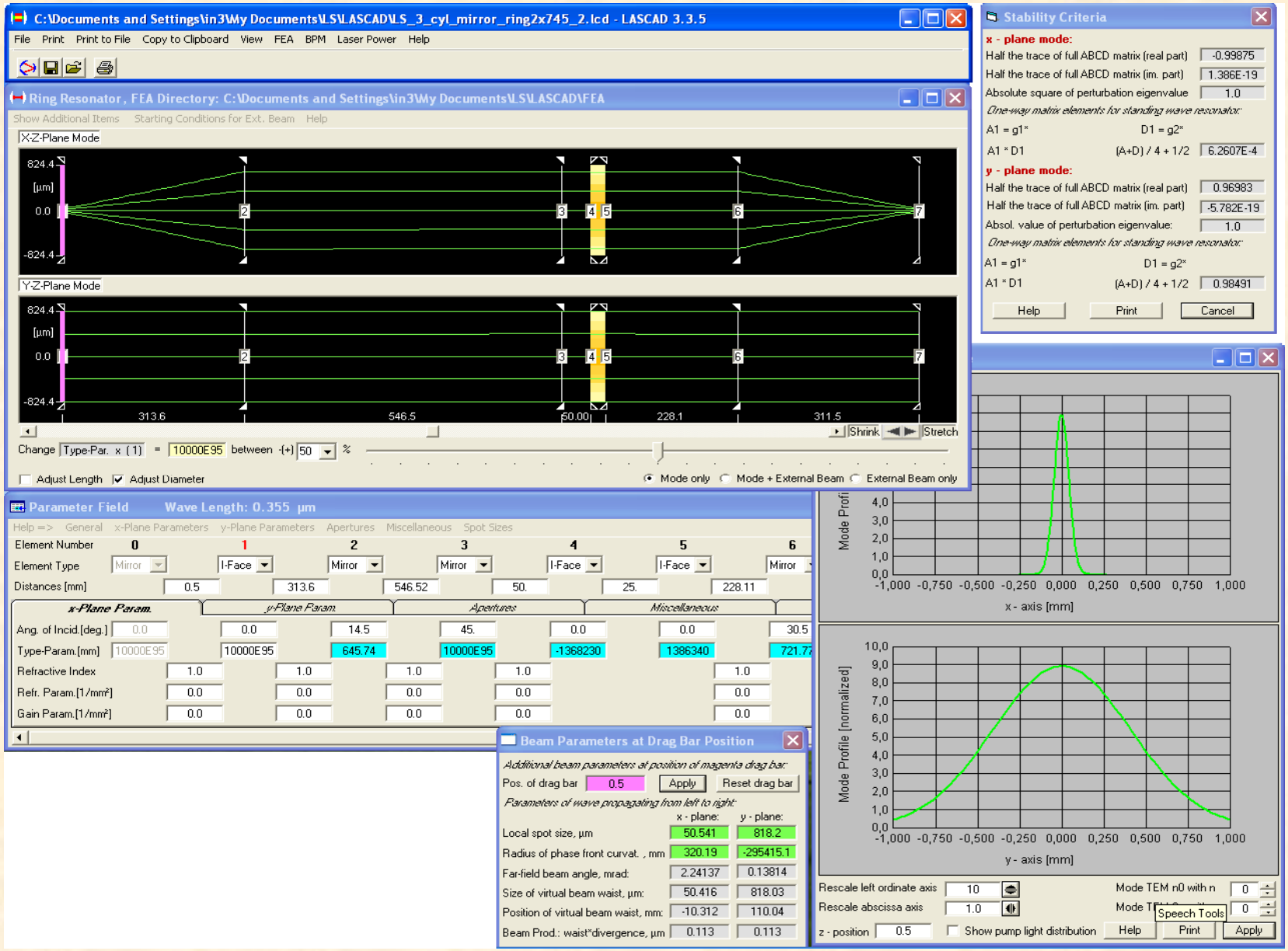


+ Simple optics and coating scheme for input of laser beam. Possibility of using Brewster angle.

- Additional two reflecting (scattering) surfaces and medium with nonlinear properties is installed inside the resonator. Nonlinear phase accumulation is bigger per roundtrip.

- Added thickness of optical material increase thermolensing effects.


Mirror
60°
y
x
z
355nm
LBO THG II
90°
100 mm
T_c=5 ns
40°
H^o, E=1Gev, τ=50 ps, T_b=2.5 ns
Mirror
30°
Input mirror
1064nm
532nm
LBO SHG I
% R
nm
532
1064
355


C:\Documents and Settings\in3\My Documents\LS\LASCAD\LS_3_cyl_mirror_ring2x745_2.lcd - LASCAD 3.3.5
File Print Print to File Copy to Clipboard View FEA BPM Laser Power Help
Ring Resonator, FEA Directory: C:\Documents and Settings\in3\My Documents\LS\LASCAD\FEA
Show Additional Items Starting Conditions for Ext. Beam Help
X-Z-Plane Mode
Y-Z-Plane Mode
824.4
[µm]
0.0
-824.4
313.6
546.5
50.00
228.1
311.5
Shrink
Stretch
Change Type-Par. x (1) = 10000E95 between -(+) 50 %
Adjust Length
Adjust Diameter
Mode only
Mode + External Beam
External Beam only
Stability Criteria
x - plane mode:
Half the trace of full ABCD matrix (real part) -0.99875
Half the trace of full ABCD matrix (im. part) 1.386E-19
Absolute square of perturbation eigenvalue 1.0
One-way matrix elements for standing wave resonator:
A1 = g1* D1 = g2*
A1 * D1 (A+D) / 4 + 1/2 6.2607E-4
y - plane mode:
Half the trace of full ABCD matrix (real part) 0.96983
Half the trace of full ABCD matrix (im. part) -5.782E-19
Absol. value of perturbation eigenvalue: 1.0
One-way matrix elements for standing wave resonator:
A1 = g1* D1 = g2*
A1 * D1 (A+D) / 4 + 1/2 0.98491
Help Print Cancel
Parameter Field Wave Length: 0.355 µm
Help => General x-Plane Parameters y-Plane Parameters Apertures Miscellaneous Spot Sizes
Element Number 0 1 2 3 4 5 6
Element Type Mirror I-Face Mirror Mirror I-Face I-Face Mirror
Distances [mm] 0.5 313.6 546.52 50. 25. 228.11
x-Plane Param. y-Plane Param. Apertures Miscellaneous
Ang. of Incid.[deg.] 0.0 0.0 14.5 45. 0.0 0.0 30.5
Type-Param.[mm] 10000E95 10000E95 645.74 10000E95 -1368230 1386340 721.77
Refractive Index 1.0 1.0 1.0 1.0 1.0
Refr. Param.[1/mm²] 0.0 0.0 0.0 0.0 0.0
Gain Param.[1/mm²] 0.0 0.0 0.0 0.0 0.0
Beam Parameters at Drag Bar Position
Additional beam parameters at position of magenta drag bar:
Pos. of drag bar 0.5 Apply Reset drag bar
Parameters of wave propagating from left to right:
x - plane: y - plane:
Local spot size, µm 50.541 818.2
Radius of phase front curvat. , mm 320.19 -295415.1
Far-field beam angle, mrad: 2.24137 0.13814
Size of virtual beam waist, µm: 50.416 818.03
Position of virtual beam waist, mm: -10.312 110.04
Beam Prod.: waist*divergence, µm 0.113 0.113
Mode Profile
x - axis [mm]
Mode Profile [normalized]
y - axis [mm]
Rescale left ordinate axis 10
Rescale abscissa axis 1.0
z - position 0.5
Show pump light distribution
Mode TEM n0 with n 0
Speech Tools
Help Print Apply

Conclusion

- **LBO crystals purchased**
- **We have discussed cylindrical mirrors with a few manufactures optics**
- **New laser room is on the way**