NCSX Edge Modeling with PIES

Tom Kaiser
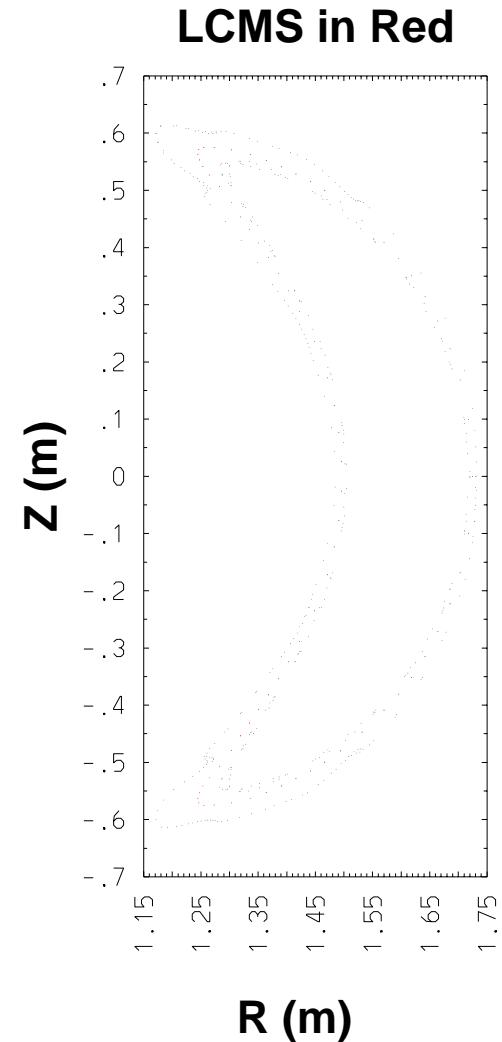
LLNL

Stellarator Edge Theory Teleconference

8 July 2004

LCMS is Determined Visually
from Poincare Surface-of-Section

LCMS in Red

3 surfaces-of-section with starting points at:

$$(R_0 , Z_0 , \Phi_0) = \begin{cases} (1.720, 0, 0) & \text{not smooth} \\ (1.725, 0, 0) & \text{LCMS (red)} \\ (1.730, 0, 0) & \text{internal islands} \end{cases}$$
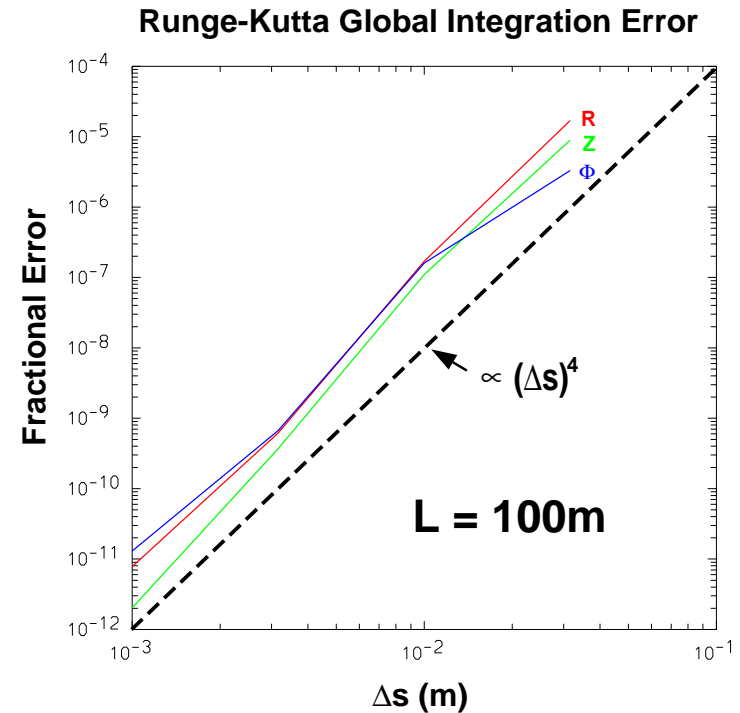

Z (m)

R (m)

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Global Integration Error Scales as L $(\Delta s)^4$
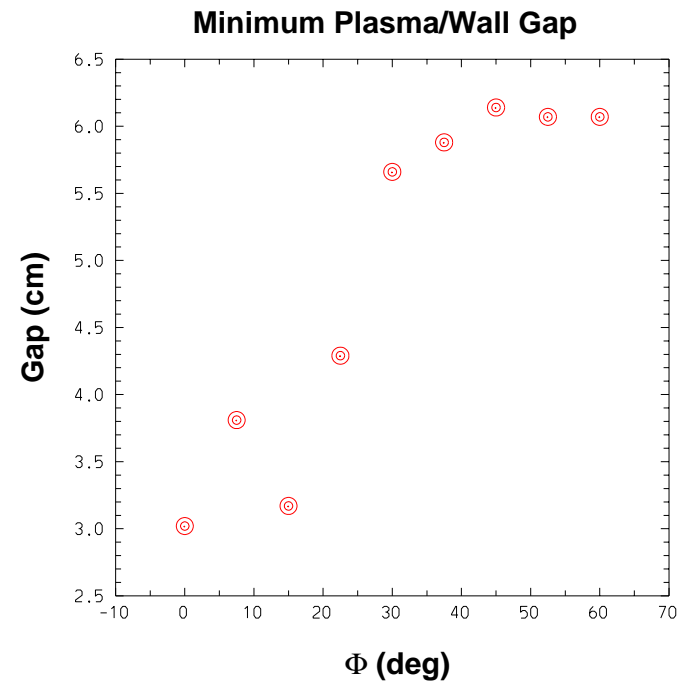
4th-order Runge-Kutta Integrator

Integration error determined by forward/backward integration (*e.g.,* 100m on LCMS)

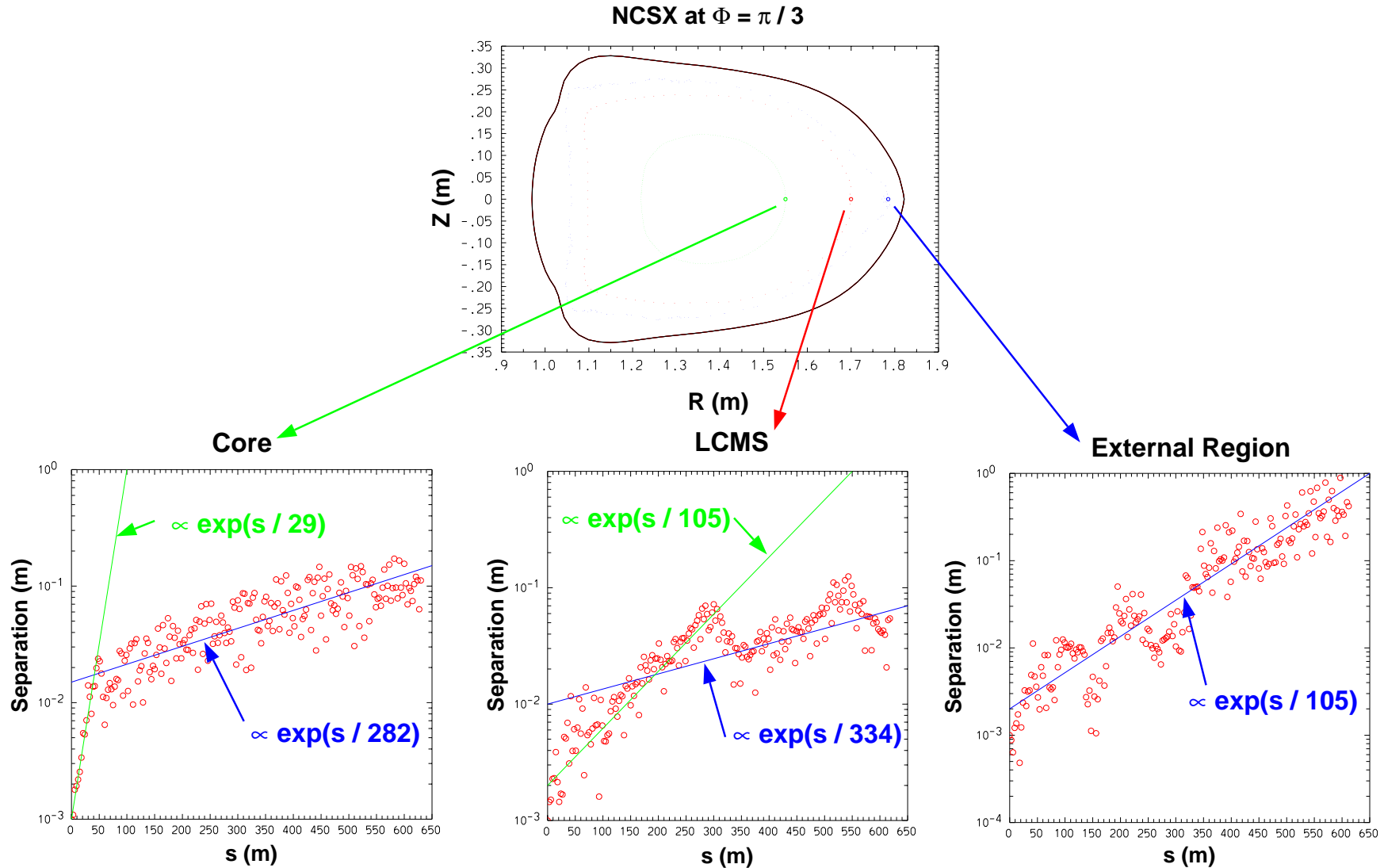$$\varepsilon \propto N\,(\Delta s)^5 \; = \; (N\,\Delta s)\,(\Delta s)^4 \; = \; L(\Delta s)^4$$

Runge-Kutta Global Integration Error

L = 100m

Plasma/Wall Gap is a Smooth Function of Φ

Minimum distance from LCMS to wall

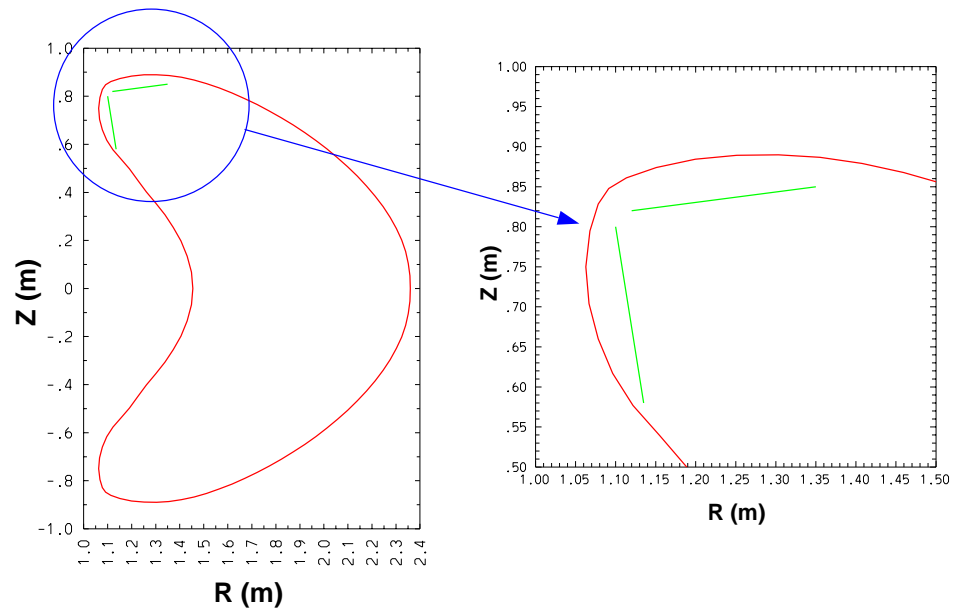**varies smoothly from 3 to 6 cm as Φ**

varies from 0 to 60°

Minimum Plasma/Wall Gap

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Rate of Field-Line Separation Depends on Starting Position

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Work in Progress

♦ **Divertor Modeling**

♦ **Benchmarking wall heat-load determination:**

- **Field-line tracing with trajectory diffusion**

- **3D finite-difference solution of electron energy transport equation (McTaggart, Zagorski, *et al*, PSI 16)**