Free Boundary Healing with the PIES Code

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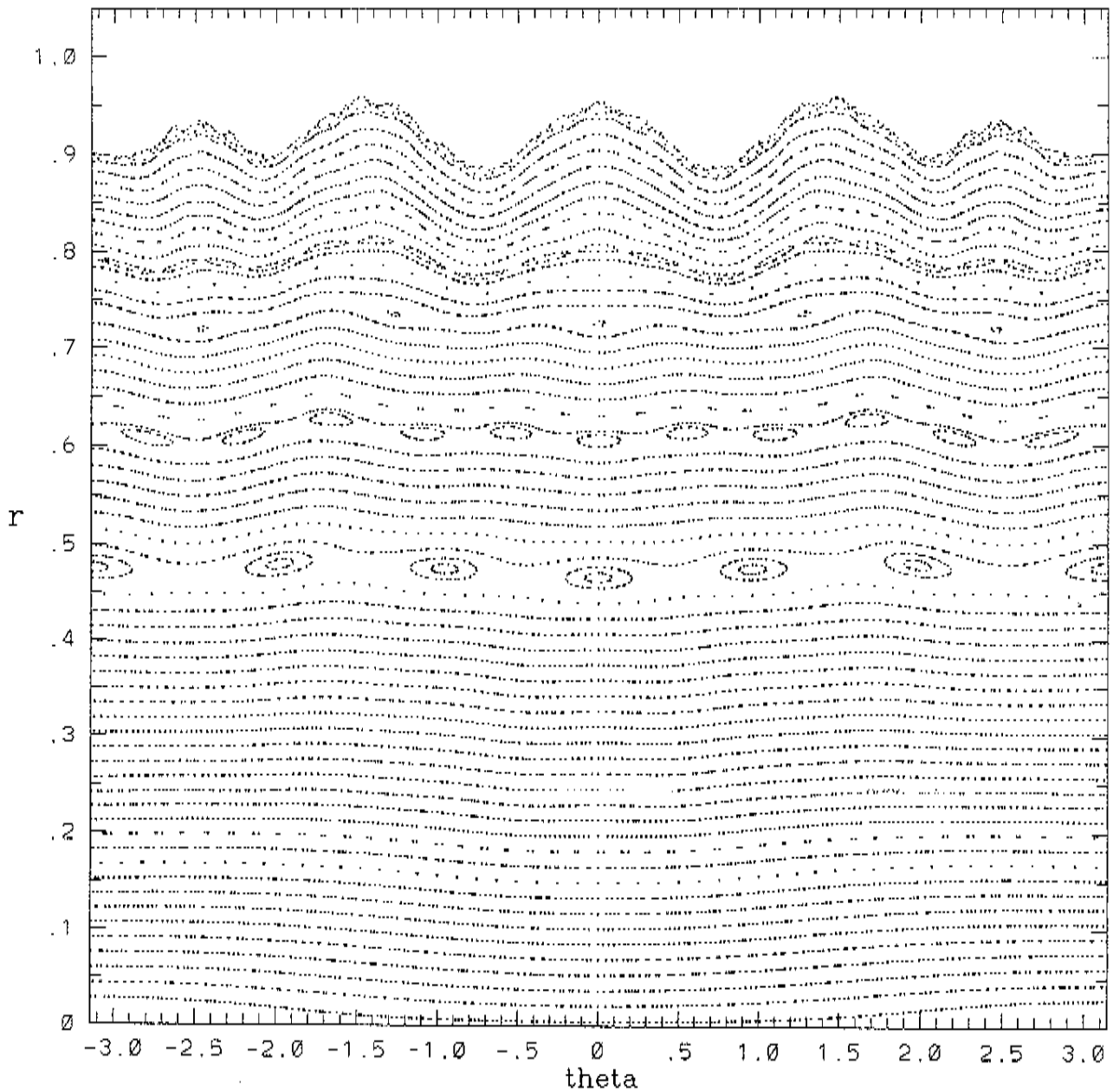
Outline

- Best case for li383 09/07 coil set
  - The 09/07 coil set has been optimized for island suppression by modifying the parameters that describe the coil position on the winding surface.
  - Plot (A) is the PIES Poincare plot for the healed coils after 400 iterations. It show a significant reduction of the islands as compared with plot (B) which is the PIES Poincare plot after 400 iteration for the unhealed islands.
  - Plot (C) is a plot of the coils, original and healed overlayed. It is seen that the coils moved very little to achieve the healing of the islands.
  - Plot (D) is a plot of the radial field (actually, b.grad(rho)/b.grad(phi)) produced by the original and healed coils. The difference accounts for an island of about 25% of the plasma radius.

- li383 10/17 coil set
  - The 10/17 coil set has been optimized for island suppression and non-rippling of the plasma surface by modifying the parameters that describe the coil position on the winding surface.
  - Plot (E) is the PIES Poincare plot after 10 PIES iterations using the healed 10/17 coils and plot (F) is the original coils after 10 PIES iterations.
  - Plot (G) is the PIES Poincare plot after 200 PIES iterations using the healed coils.
  - Plot (H) is the PIES Poincare plot after 180 PIES iterations using the original coils.

A

- **PIES Poincare plot for the healed 09/07 coils after 400 iterations.**

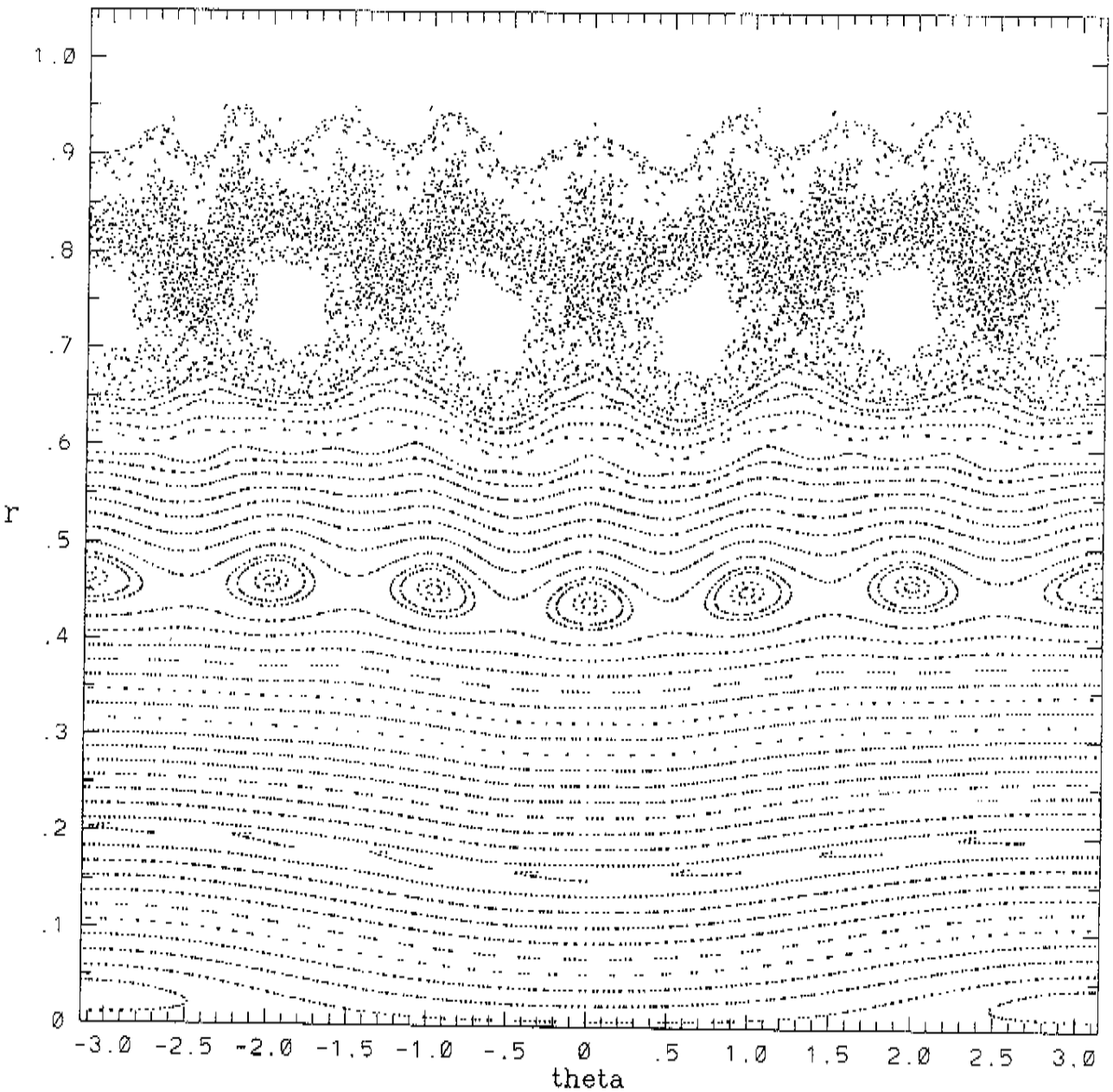


it=401 rpoinc: background coordinates
li383a25 original coils

Plot 1

B

- **PIES Poincare plot for the original 09/07 coils after 400 iteration.**

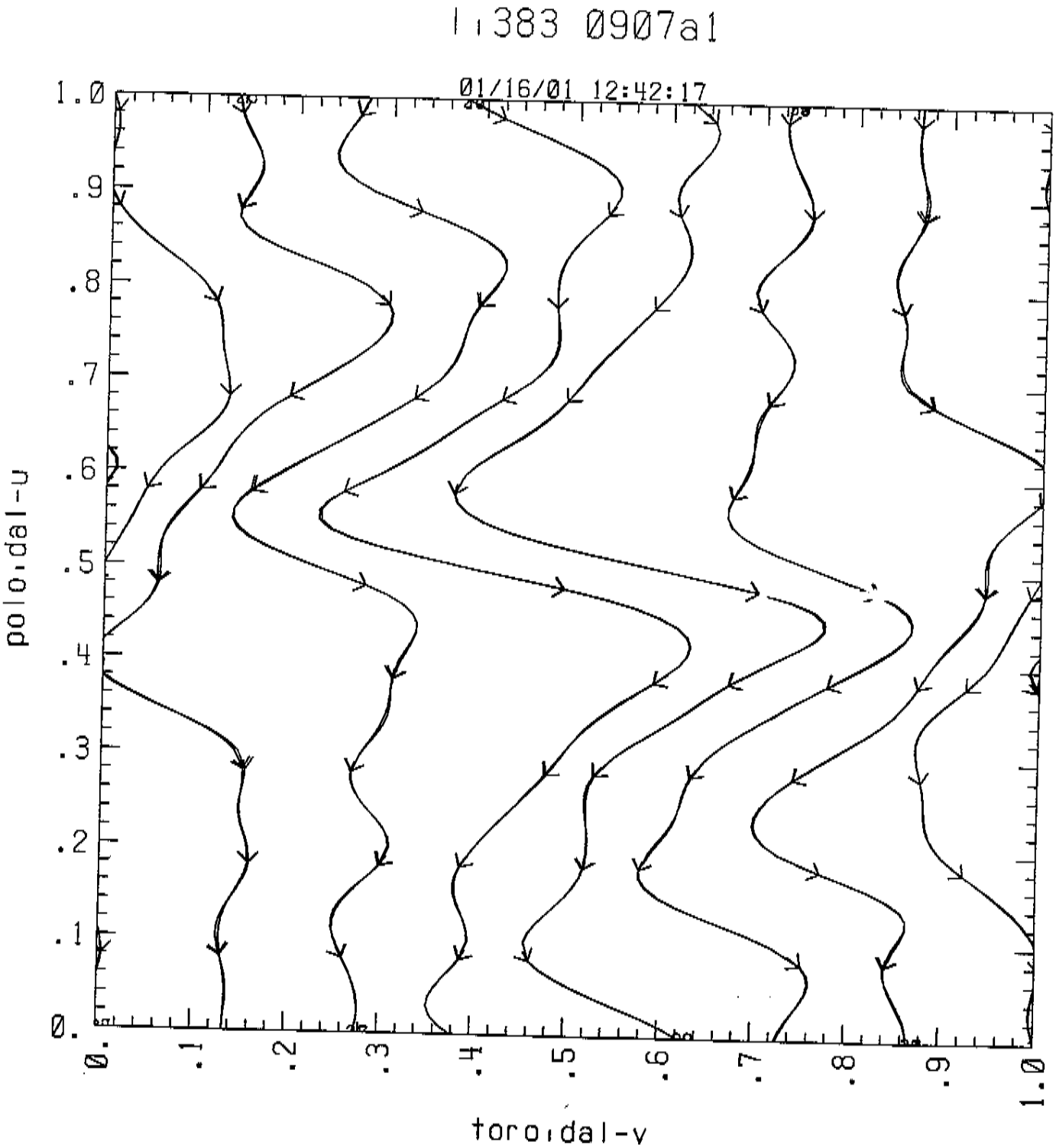


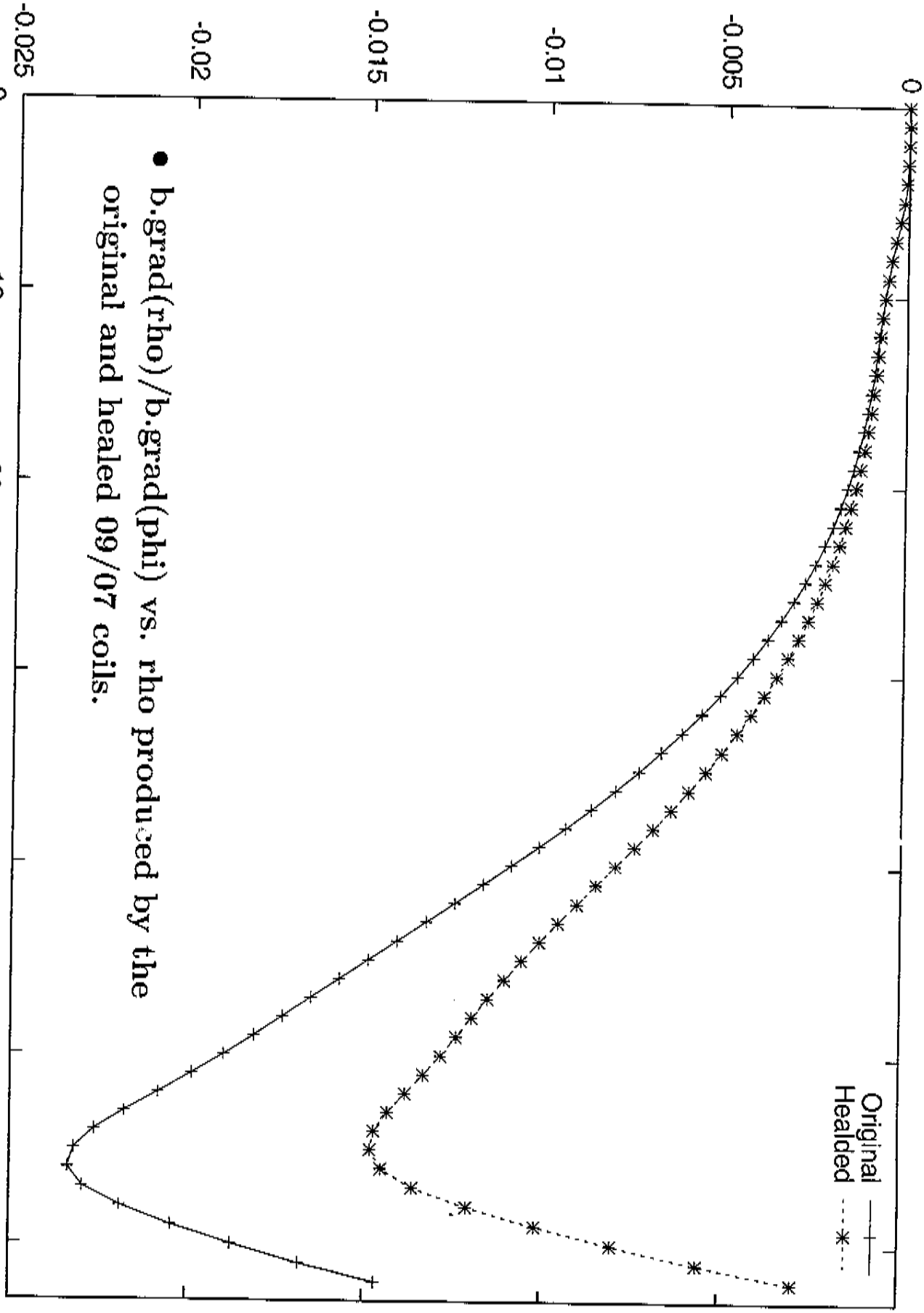
it=402 rpoinc: background coordinates
li383a25 original coils

Plot 6

C

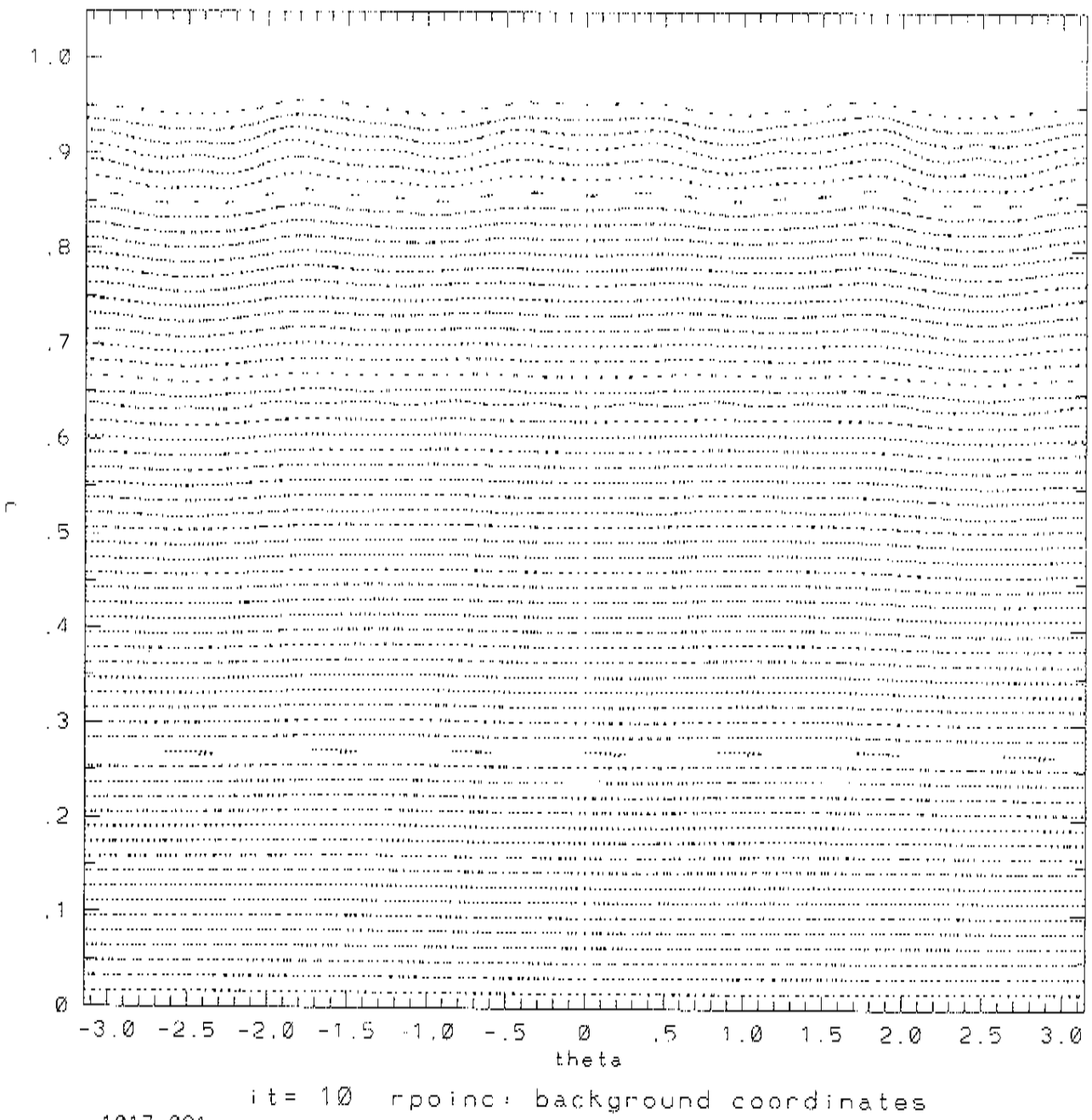
- **Plot of the coils, 09/07, original and healed overlayed. islands.**





- b.grad(rho)/b.grad(phi) vs. rho produced by the original and healed 09/07 coils.

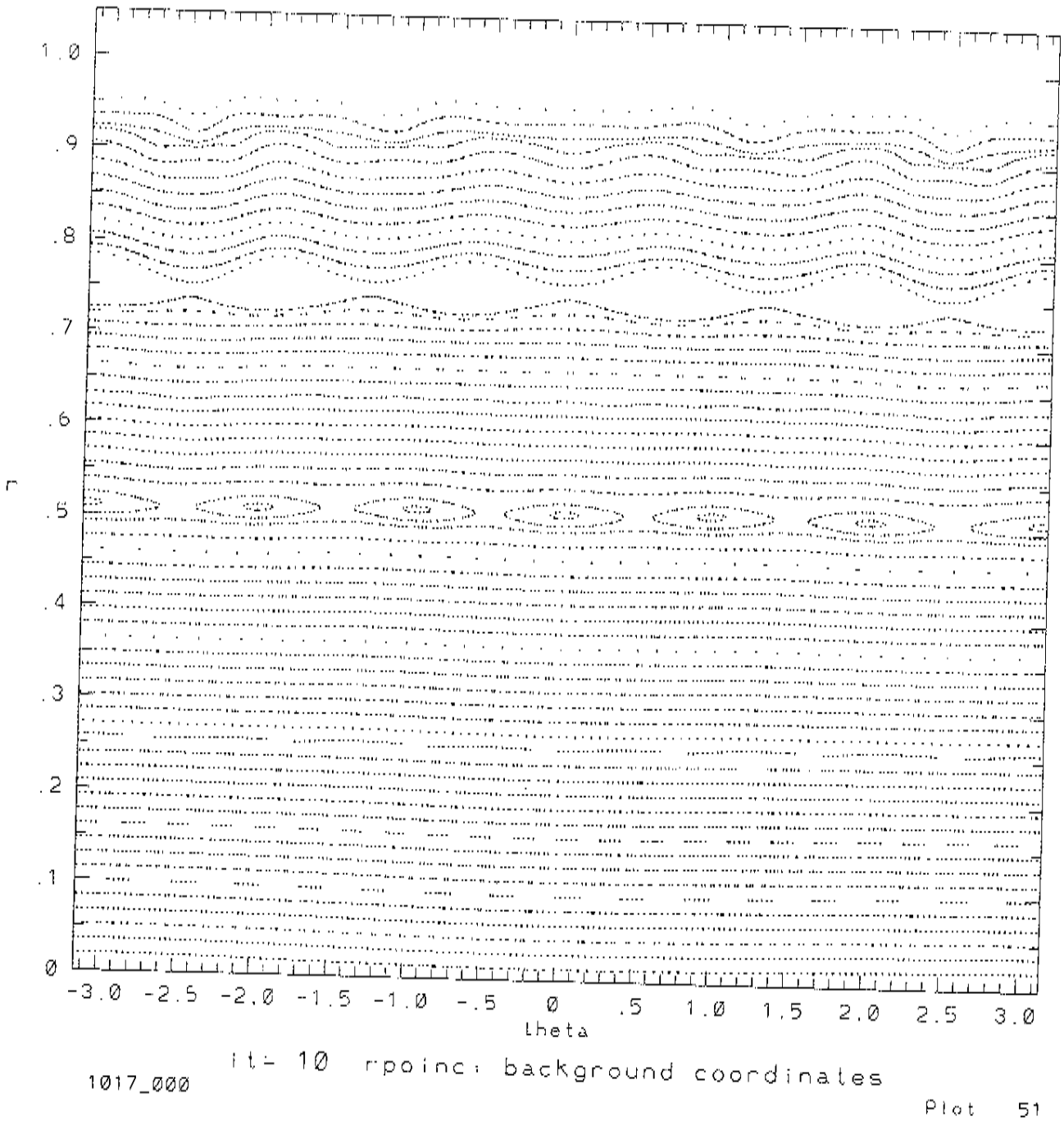
- **PIES Poincare plot after 10 PIES iterations using the healed 10/17 coils.**



jord /local/shudson/c/2/

F

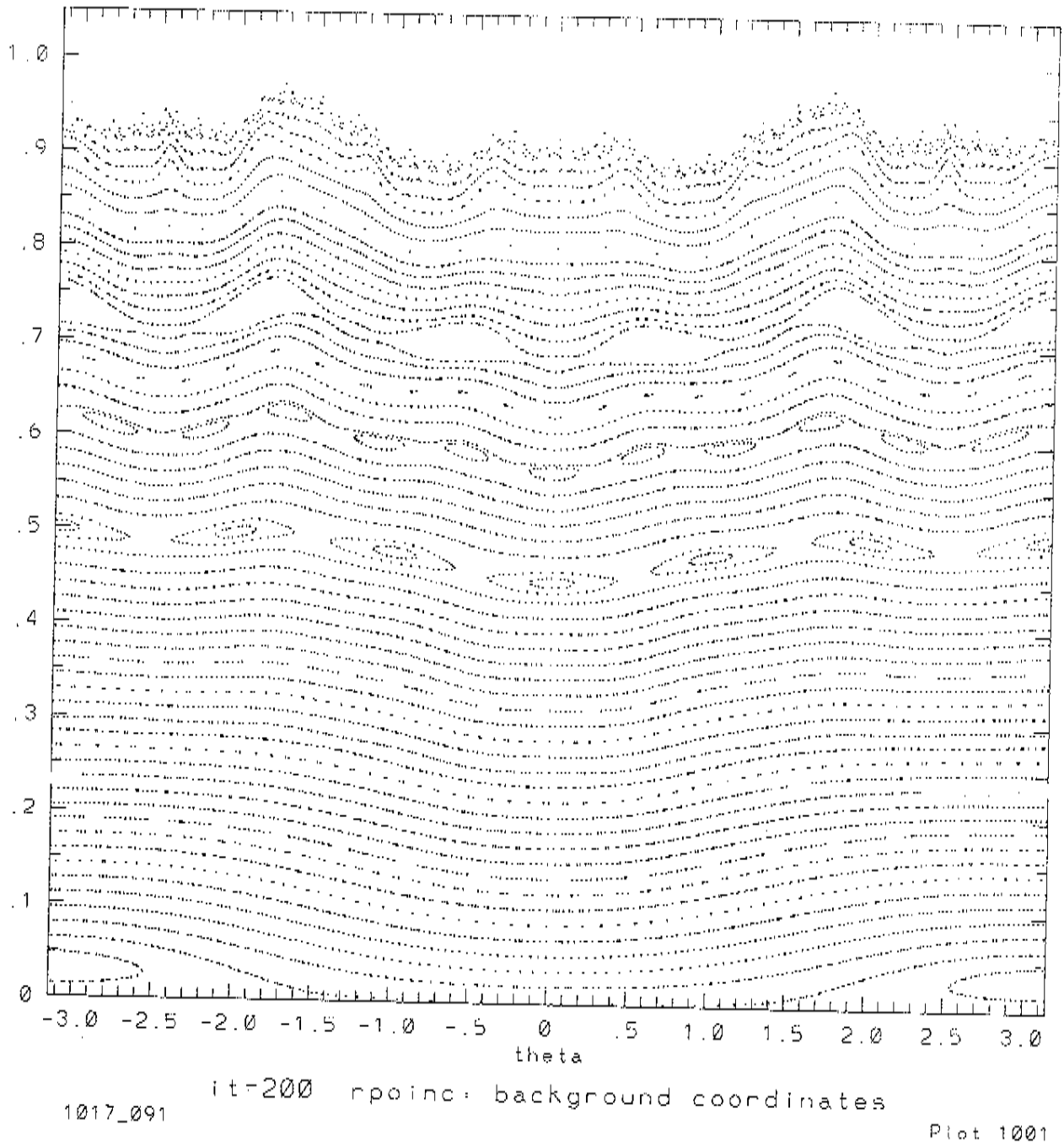
- **PIES Poincare plot after 10 PIES iterations using the original 10/17 coils.**



jord /local/shudson/C/1/

G

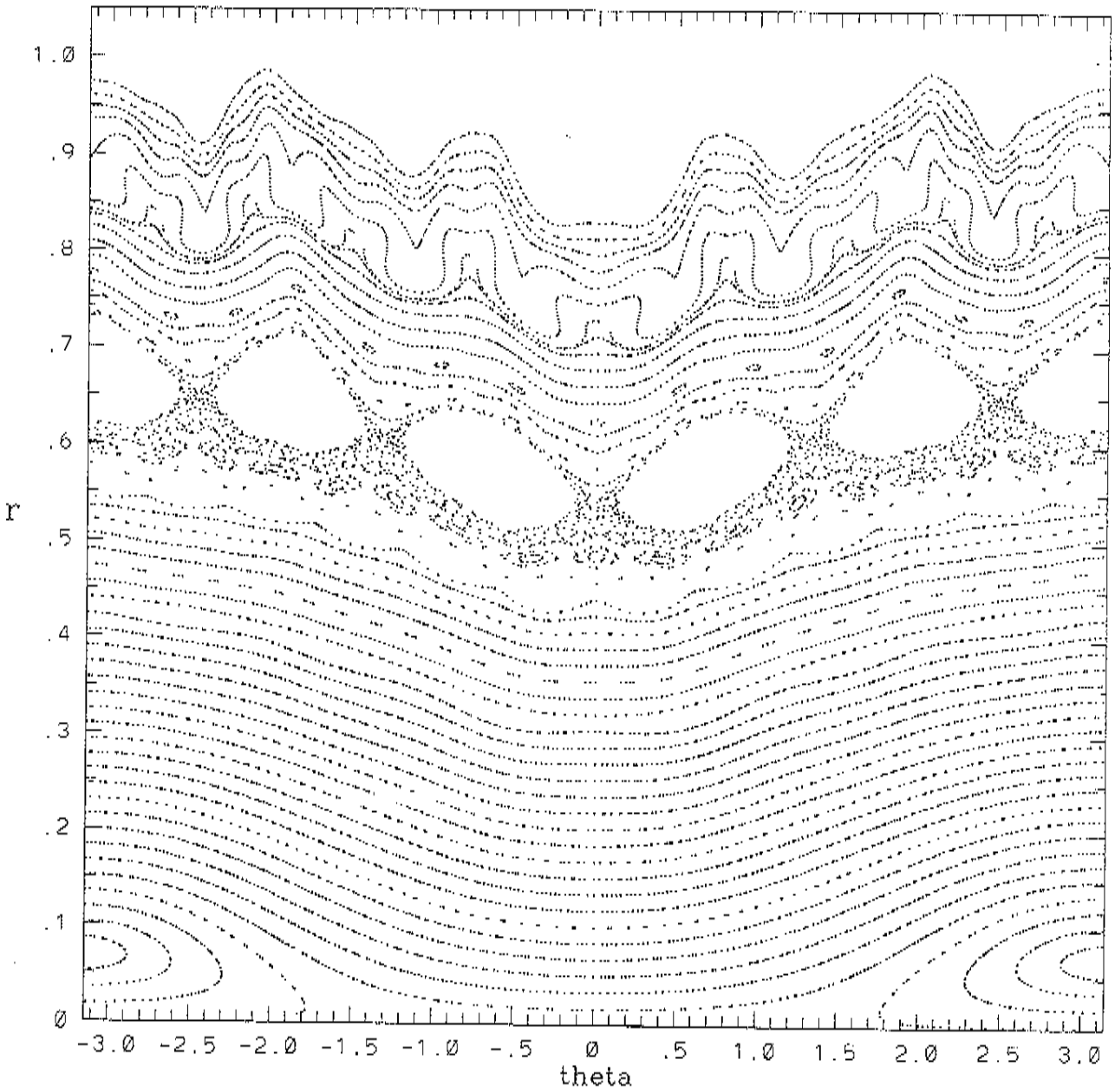
- **PIES Poincare plot after 200 PIES iterations using the healed 10/17 coils.**



jord /local/shudson/c/2/091/

H

- **PIES Poincare plot after 180 PIES iterations using the original 10/17 coils.**



it=184 rpoinc: background coordinates

1017 000

Plot 776