Monthly Highlights

for

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Light Water Reactor Thermal Hydraulic Development Division

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## 1. Nonequilibrium Phase Change Studies

### 1.1 Development of Analytical Modeling (B.J.C. Wu)

The BNL vapor generation model was extended to $\alpha > 0.25$. The proposed model of vapor generation following flashing inception consists of heat transfer coefficients for vaporization, vapor-liquid velocity slip and interfacial area density in five flow regimes covering the entire void fraction range $0 < \alpha < 1$.

### 1.2 Flashing Experiments (G. Zimmer, J.H. Klein, B.J.C. Wu, and N. Abuaf)

Flashing experiments were conducted at 121°C and 100°C inlet temperatures while varying the flow rate and the condensing tank (nozzle back) pressure. Axial pressure distributions were recorded in addition to the transverse chordal-averaged void profiles at various axial locations. For each axial location area-averaged void fractions were calculated from these detailed void distributions. The experimental data obtained in addition to the results presented previously fulfill the requirements of the proposed test matrix.

Figures 1 and 2 present the area-averaged void profiles compared with the diametral-averaged centerline void fractions (A) and the pressure drop distribution (B) along the nozzle for two runs performed at an inlet temperature of ~149 C, and flow conditions specified on the Figures.

The centerline void fraction corresponds to the area-averaged value (Figure 1) or deviates from it (Figure 2) depending on the transverse void profile present in the test section. The detailed transverse void profiles for the two runs are presented in Figures 3 and 4 for four axial locations corresponding to pressure taps 47, 45, 43 and 41.

These results show that differences may exist between the centerline diametral-averaged void fraction and the area-averaged value. To make fair comparisons between code predictions and experiments these effects must be carefully considered.

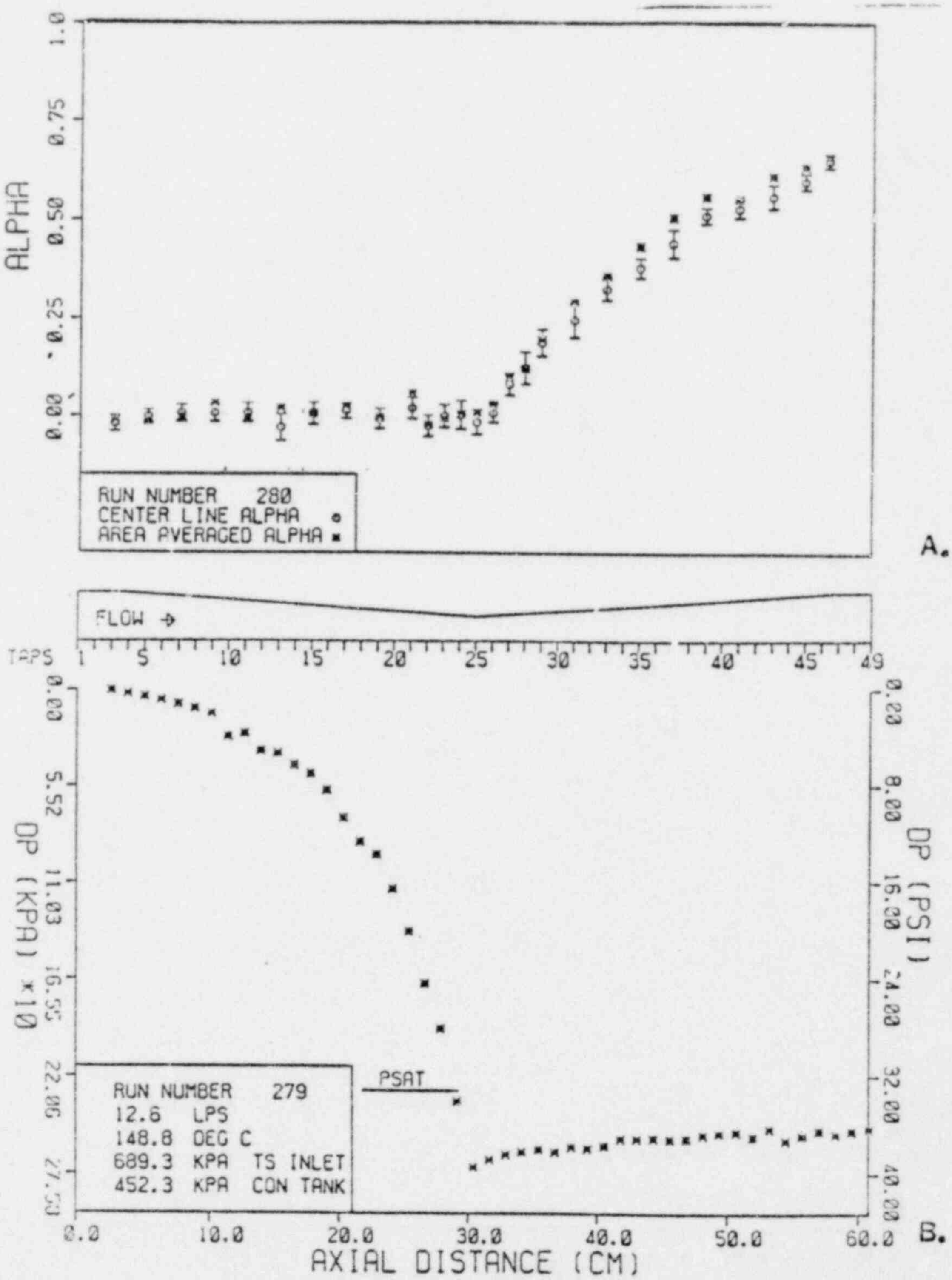


Figure 1. Axial distributions of the area-averaged and the center line diametral void fractions (A) and of the pressure drop (B) in the test section. Runs 279 and 280 were performed under the following conditions: $p_{in}$= 689.3 kPa, $T_{in}$= 148.8 C, $p_{ct}$= 452.3 kPa and at a mass flow rate of 11.6 kg/s. (BNL Neg. No. 6-950-80).

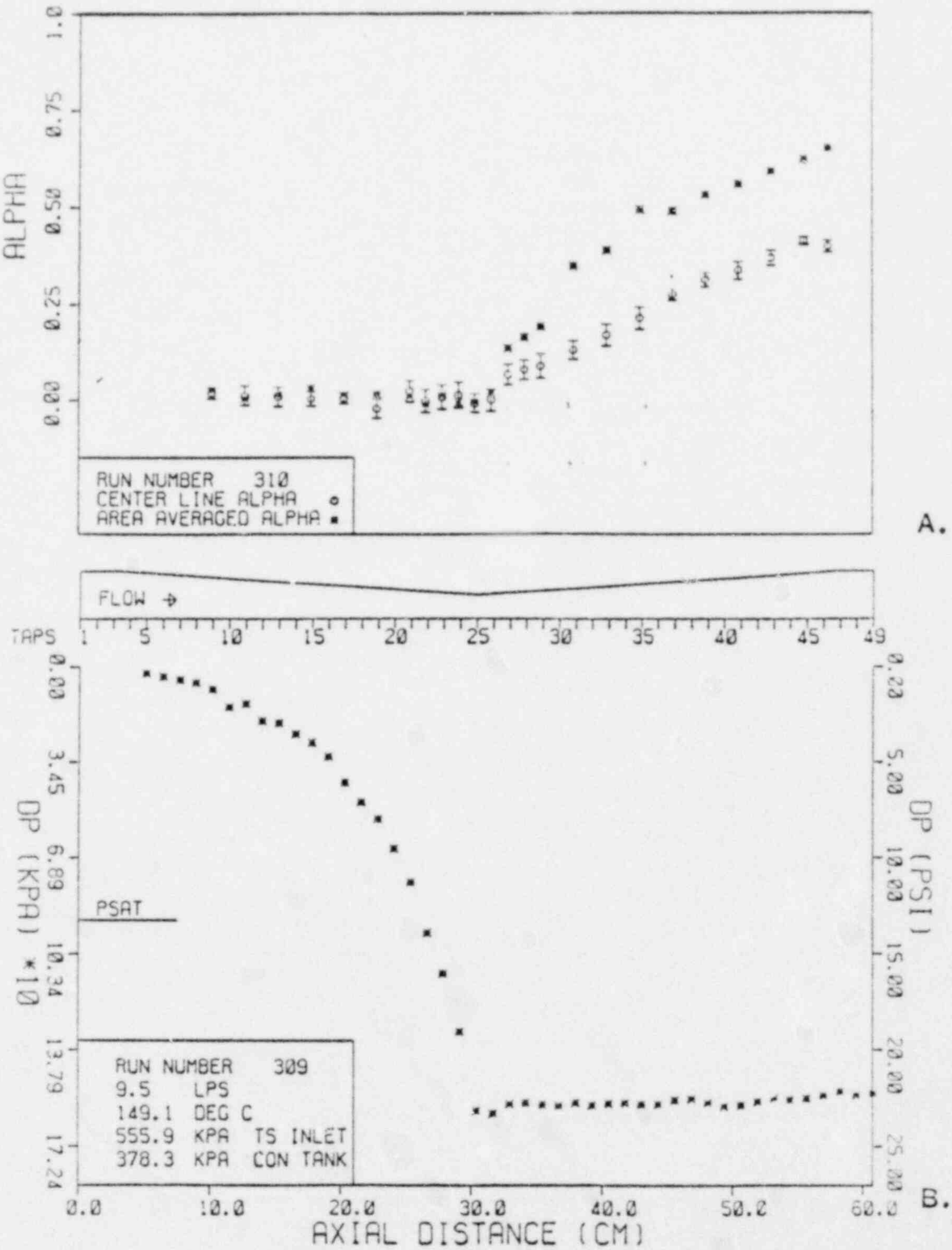


Figure 2. Axial distributions of the area-averaged and the center line diametral void fractions (A) and of the pressure drop (B) in the test section. Runs 309 and 310 were performed under the following conditions: $p_{in}$= 555.9 kPa, $T_{in}$= 149.1 C, $p_{ct}$= 378.3 kPa and at a mass flow rate of 8.8 kg/s. (BNL Neg. No. 6-955-80).

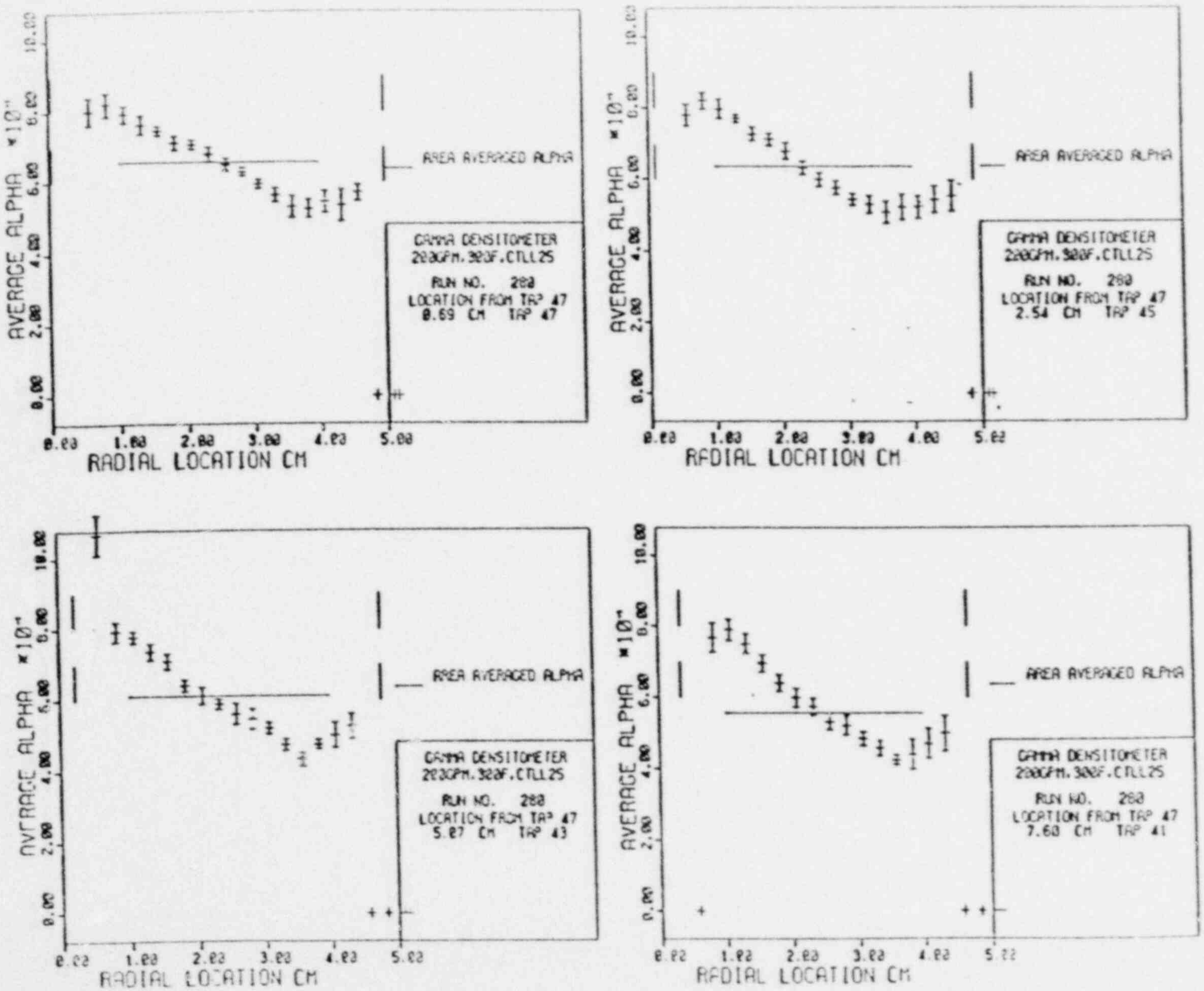


Figure 3. Transverse distributions of the chordal-averaged void fractions at axial locations corresponding to pressure taps 47, 45, 43 and 41 for Run 280 presented in Figure 1.11. (BNL Neg. No. 6-948-80).

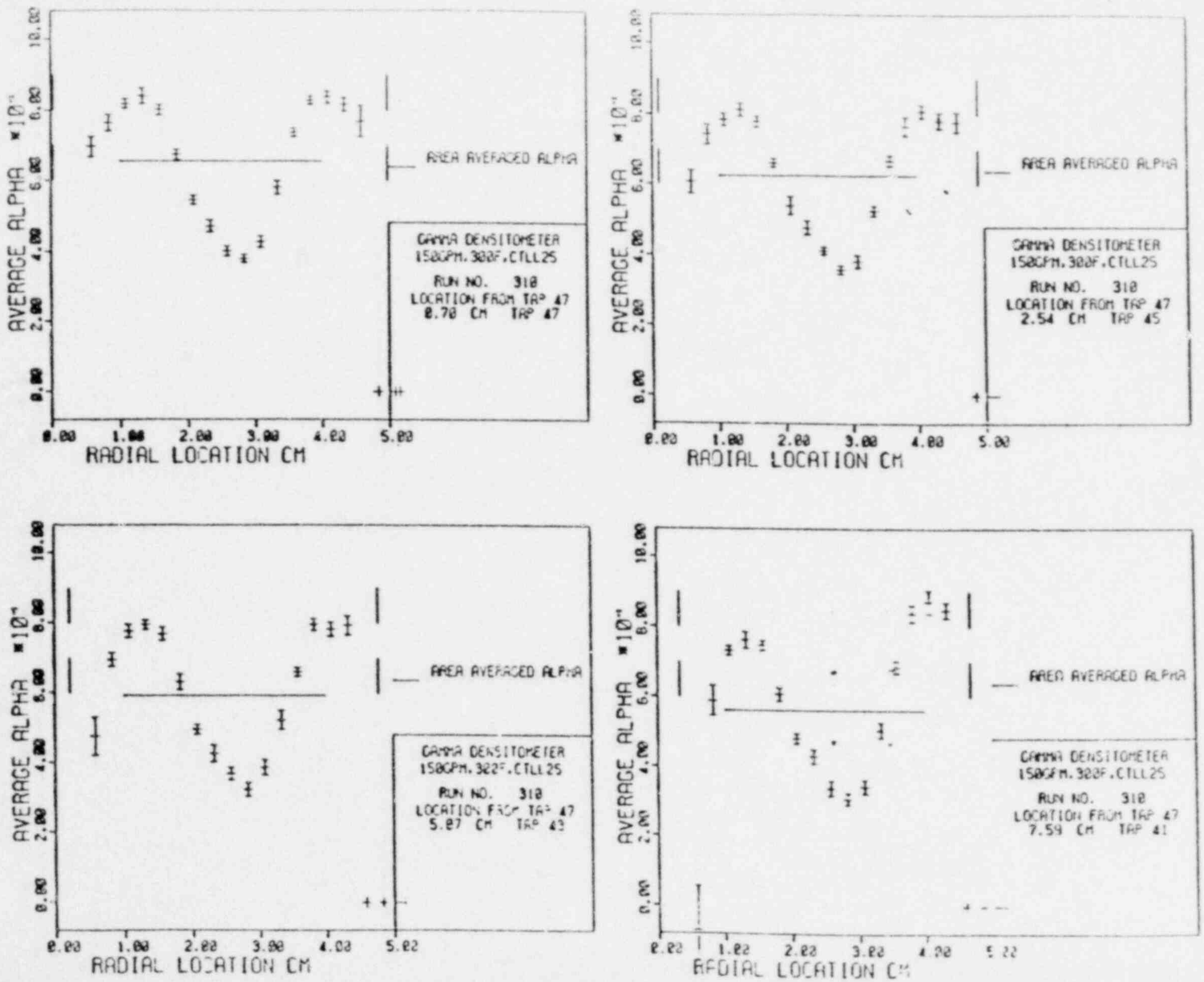


Figure 4. Transverse distributions of the chordal-averaged void fractions at axial locations corresponding to pressure taps 47, 45, 43 and 41 for Run 310 presented in Figure 1.15. (BNL Neg. No. 6-949-80).

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