INTERIM REPORT

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Monthly Highlights

for

May, 1980*

Light Water Reactor Thermal Hydraulic Development Division

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* Work carried out under the auspices of the United States Nuclear Regulatory Commission.

2. Nonequilibrium Phase Change Studies

2.1 Development of Analytical Modeling (B.J.C. Wu)

Work continued on the extension of BNL vapor generation model to $\alpha > 0.25$.

2.2 Flashing Experiments (G.A. Zimmer, J.H. Klein, B.J.C. Wu, N. Abuaf)

The main pump of the loop sheared its shaft and had to be replaced. The electrical connections of the five Cadmium Telluride detectors mounted on the printed circuit board deteriorated due to the high temperature, and humidity environment. This caused spurious signals to be generated in the preamplifiers. Since we were unable to fix the five beam system within the available time, a decision was made to shift to a single beam system with the detector crystal encased in a hermetically sealed BNC connector. The single beam densitometer was mounted on the traversing mechanism allowing transverse void profiles to be obtained at the 27 axial locations along the test section.

With the new set-up, i.e., the single beam gamma densitometer, the test section was recalibrated both full and empty and nine flashing experiments were conducted at 149°C inlet temperatures. During these runs the flow rate and the condensing tank (nozzle back) pressure were varied. Axial pressure distributions were recorded in addition to the transverse chordal averaged void profiles at various axial locations. These void distributions were used in the calculation of the area averaged void fraction for each axial location.

Typical results of the void profiles are presented in Figures 1 and 2 for the axial locations coinciding with pressure taps 47, 45, 43 and 41 (Figure 1) close to the nozzle exit and for the axial locations of taps 26, 25, 24 and 23 (Figure 2) which are in the vicinity of the nozzle throat where flashing inception occurs. Figures 3 and 4 present respectively a plot of the area averaged void profile and pressure distributions as a function of axial location for runs No. 273-274, which were performed at an inlet flow rate of 9.5 ℓ/s and inlet pressure and temperature of 573.5 kPa and 148.7 C, respectively, and a condensing tank pressure of 451.8 kPa.

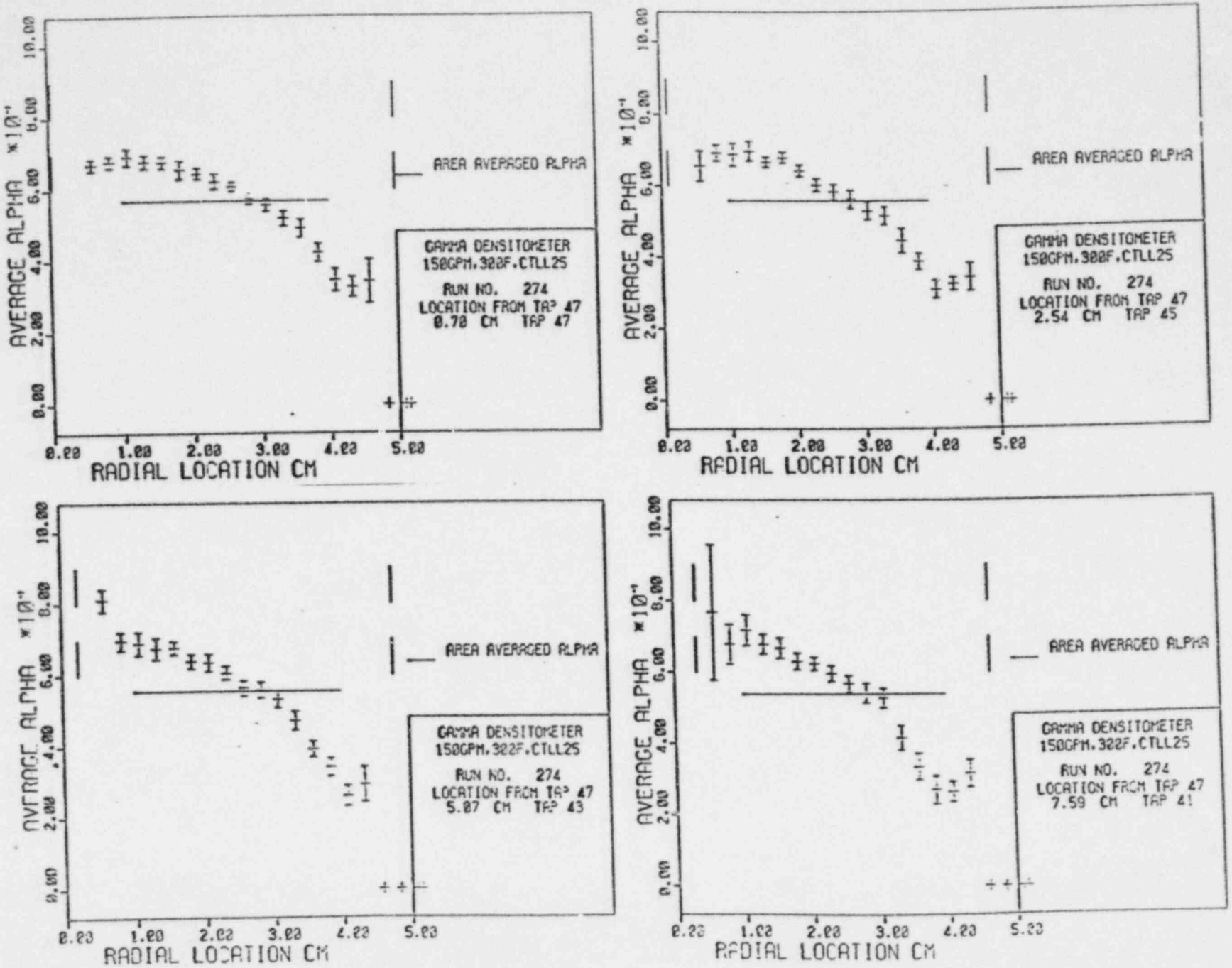

Figure 1. Chordal averaged void distributions at four axial locations near the nozzle exit for Run No. 274.

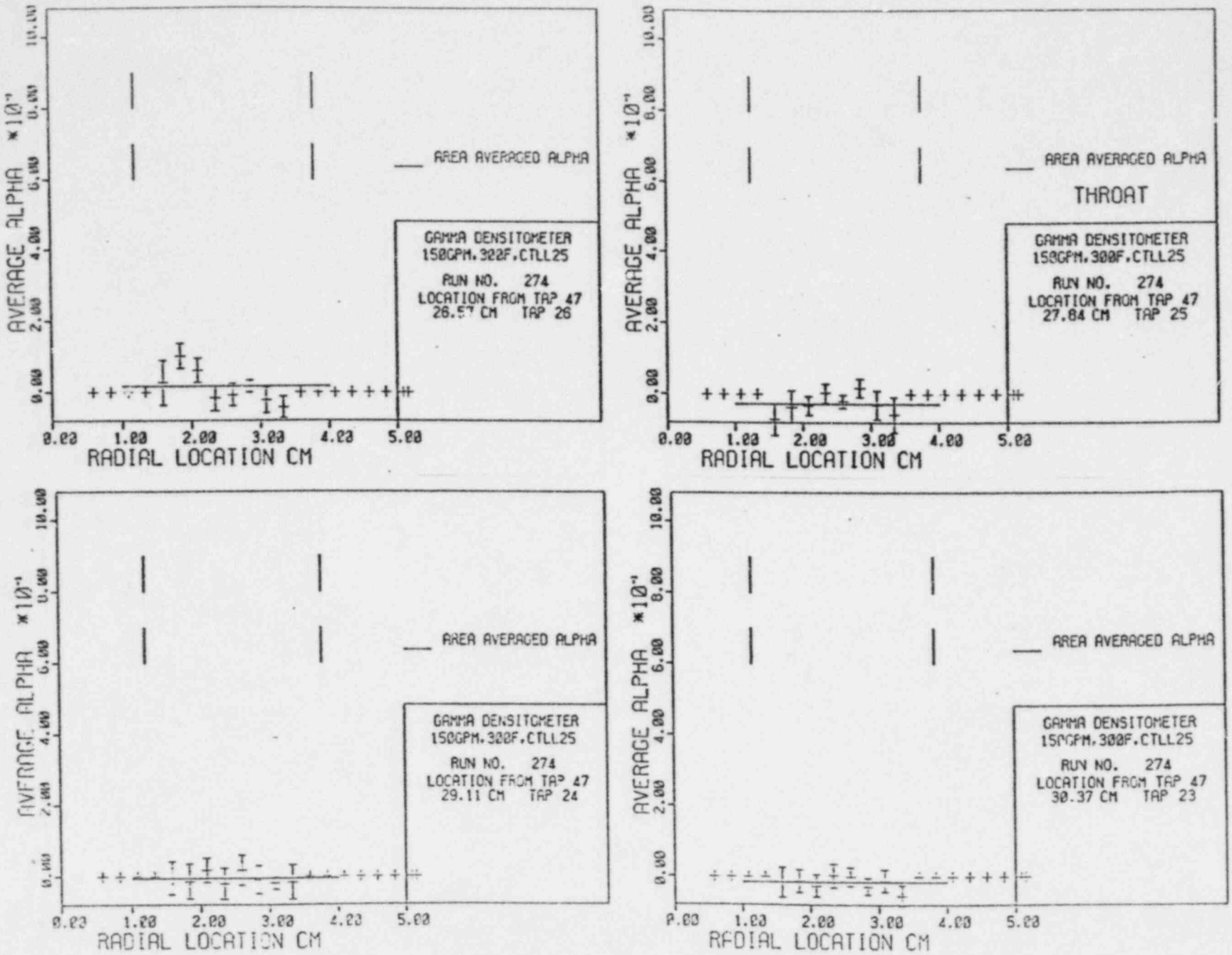

Figure 2. Chordal averaged void distributions at four axial locations in the vicinity of the nozzle throat for Run 274.

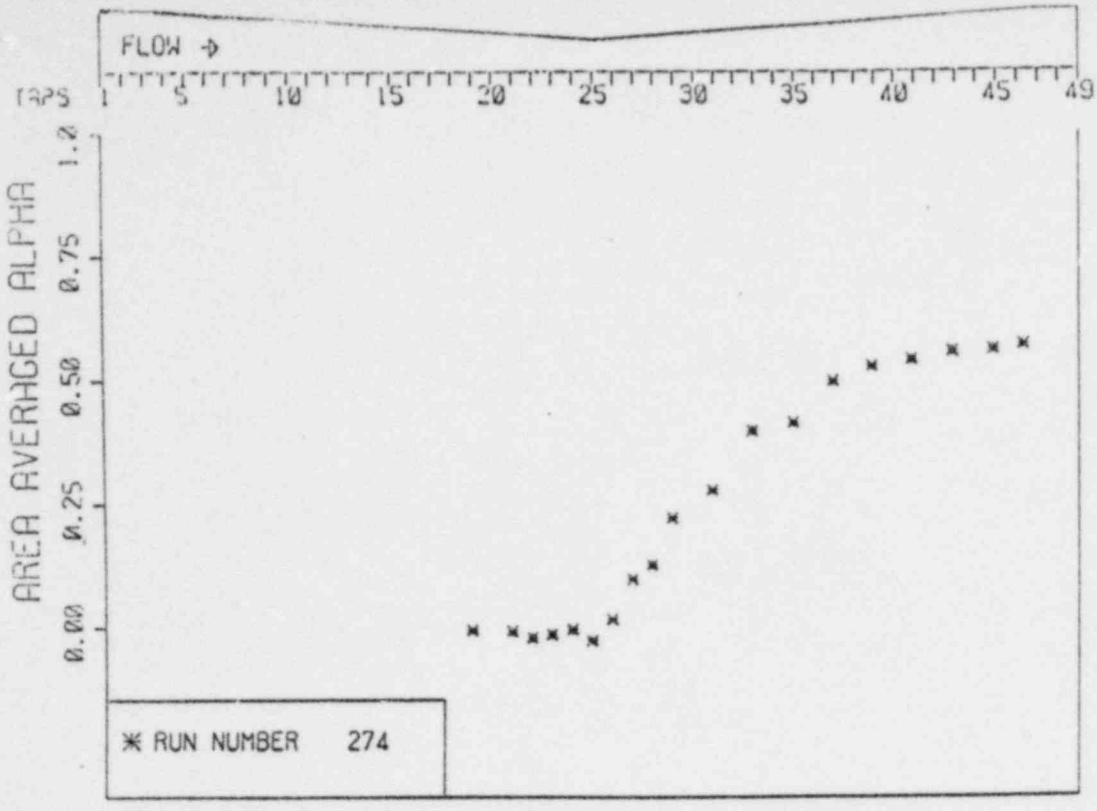

Figure 3. Axial distribution of the area averaged void fractions for Run 274.

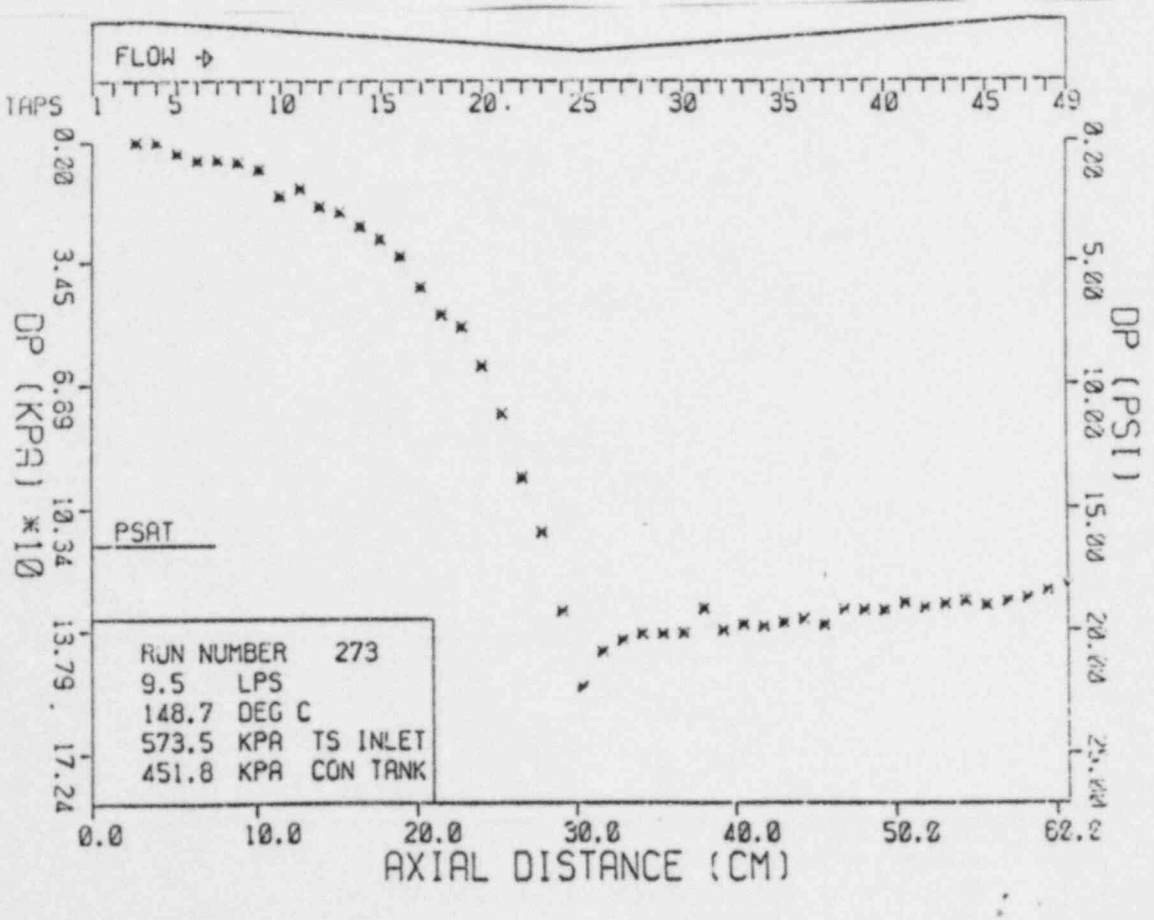

Figure 4. Pressure drop profiles as a function of axial location for Run 275.

Note: Runs 274 and 275 were conducted under identical conditions.

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