ENCLOSURE 6

GSI-191 ACRS Slide Presentation – November 19, 2010 (Non-Proprietary)

Presentation to ACRS Sub Committee

AP1000™ Long-Term Cooling

Debris Issues Resolution

Supplemental Information

November 19, 2010

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Follow–up Information From ACRS Meeting Nov 18, 2010 on GSI-191

- ## The attached information is expected to resolve questions #69, #68, #71

  - #68 - K/A^2 for AP1000 FA debris tests
  - #68, #69 - Additional <u>W</u>C/T plots for cases 6, 8, 9, 10, New1, New2
  - #69 - CHF confirmation for cases New1, New2
  - #71 – Development of DP vs fiber, including "other" test data

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#68, K/A^2 For AP1000 FA Debris Tests

- ## $\underline{W}$COBRA/TRAC Case 10
  - Acceptance criterion is 4.1 psid at [   ]^{a,c}
  - $\underline{W}$C/T used an input core inlet resistance of k/A^2 equal to 761.8 ft^{-4}

- ## Calculate resistance (k/A^2) of FA test tesults

$$\left[\right]^{a,c}$$

  - Results of calculations shown in the following tables
  - The K/A^b is calculated with an exponent of "2" and also with a test based exponent

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Tables of k/A^2 for FA Debris Tests With "b" Exponent

a,c

K/A^2 For AP1000 FA Debris Tests

- ## Comments on K/A^2 Information

  - Note that the test based exponent results in a LARGER resistances, which means that the WEC approach is more conservative

  - Test #17 has the highest resistance but maintains margin to the acceptance criteria

    - This test is included even though it is considered an invalid test because the test protocol was not followed

  - Tests #36 & 37 (higher temp tests) have the lowest resistance

    - This shows that more margin is available which may be quantified in the future to allow higher operating fiber limits for AP1000

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Additional Plots from WCOBRA/TRAC Debris Sensitivity Cases

- ## Plots provided for Cases 6, 8, 9, 10, New Case 1, New Case 2:

    - Hot assembly void fraction in top cell, 2nd to top cell over 100s interval during quasi-steady state period

    - Core inlet flow rate

    - Core inlet pressure drop

    - Downcomer collapsed liquid level

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Case 6

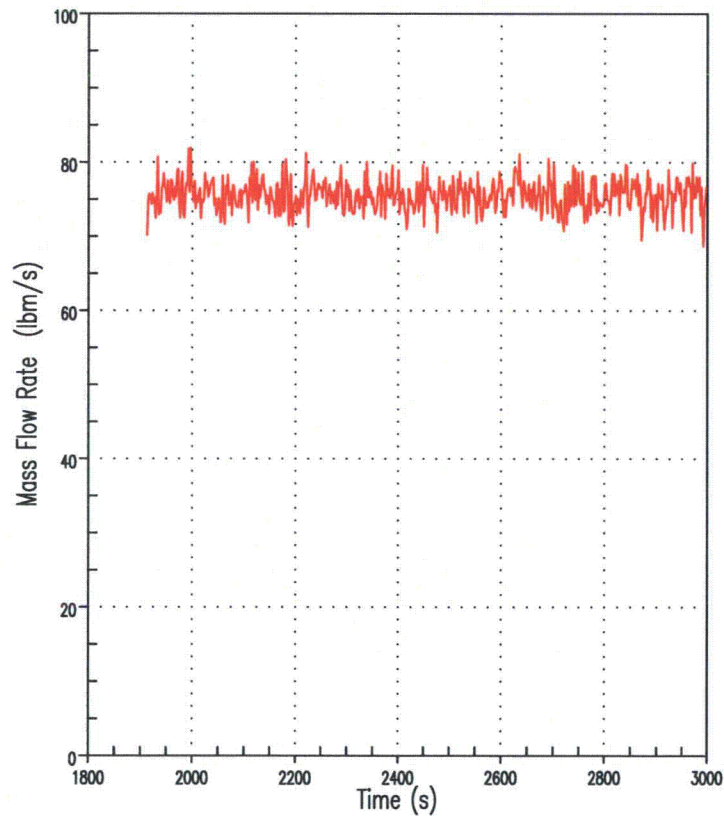AP1000 DEDVI in Loop Compartment: Case 6 K/A2=430.6
Hot Assembly Top Cell Void
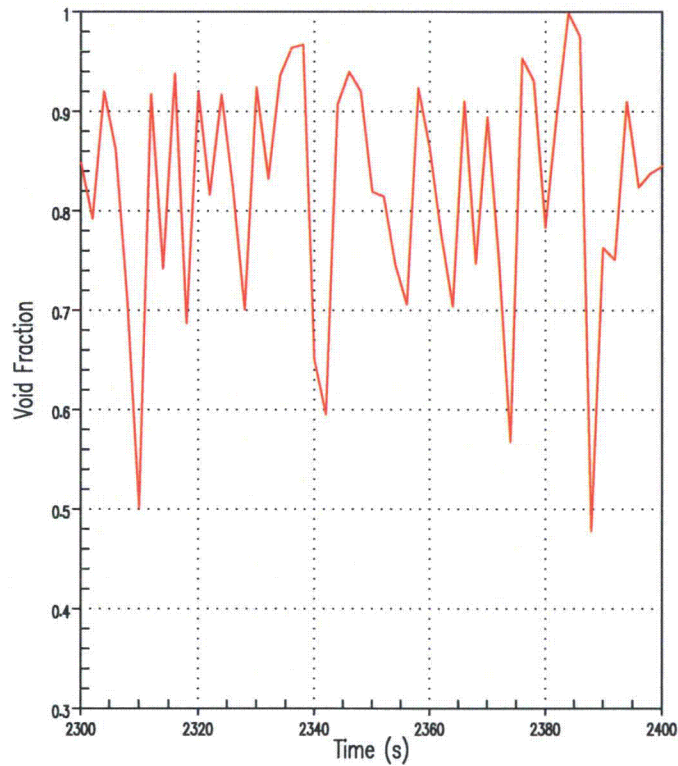
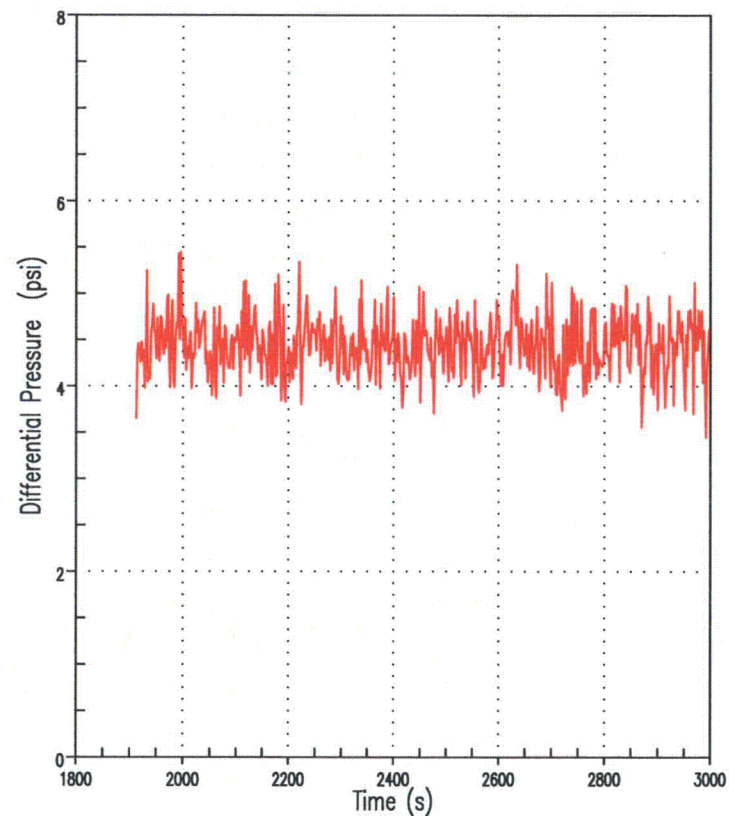AP1000 DEDVI in Loop Compartment: Case 6 K/A2=430.6
Hot Assembly Second Cell Void
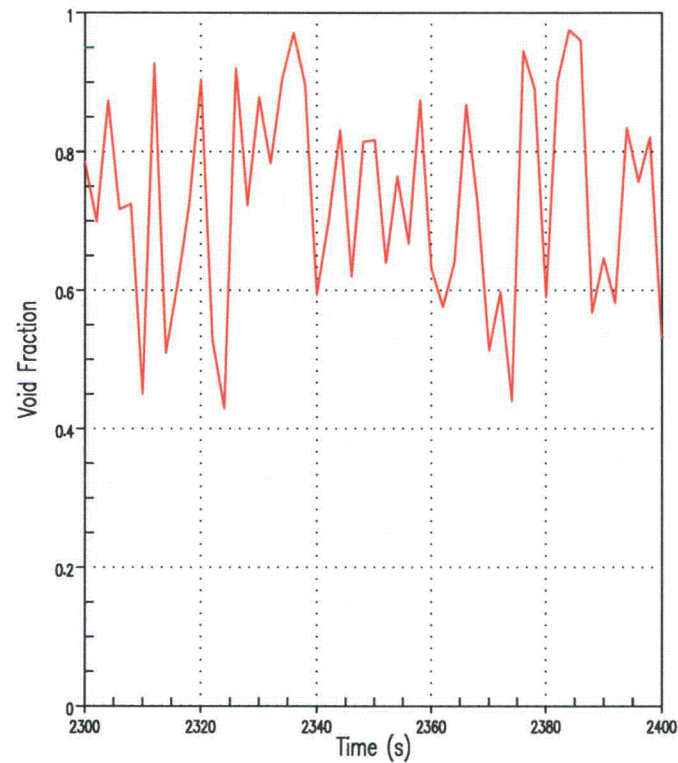
Case 6 – during quasi-steady period restart

AP1000 DEDVI in Loop Compartment: Case 6 K/A2=430.6
— Core Inlet Flow
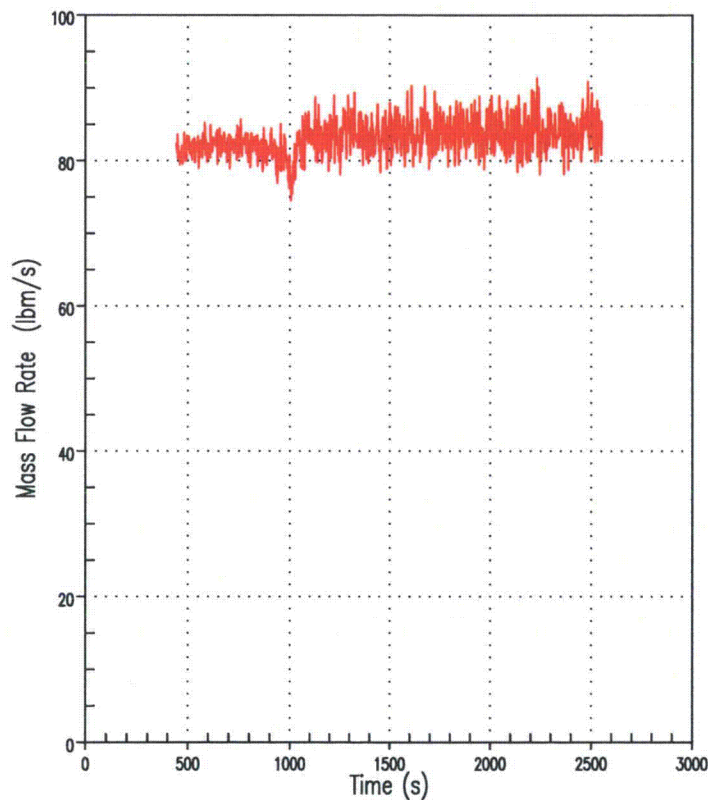
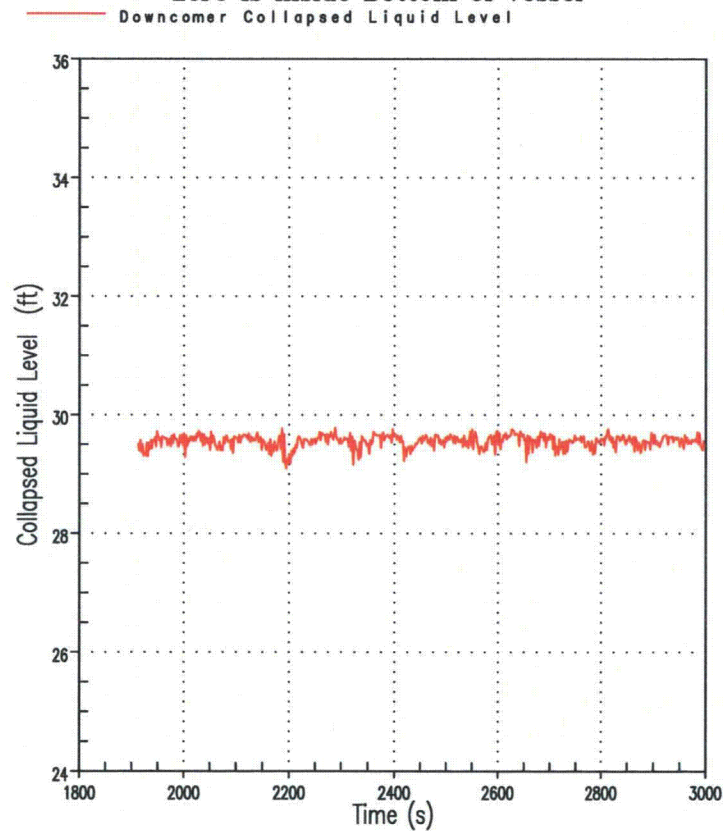AP1000 DEDVI in Loop Compartment: Case 6 K/A2=430.6
— Core inlet dP
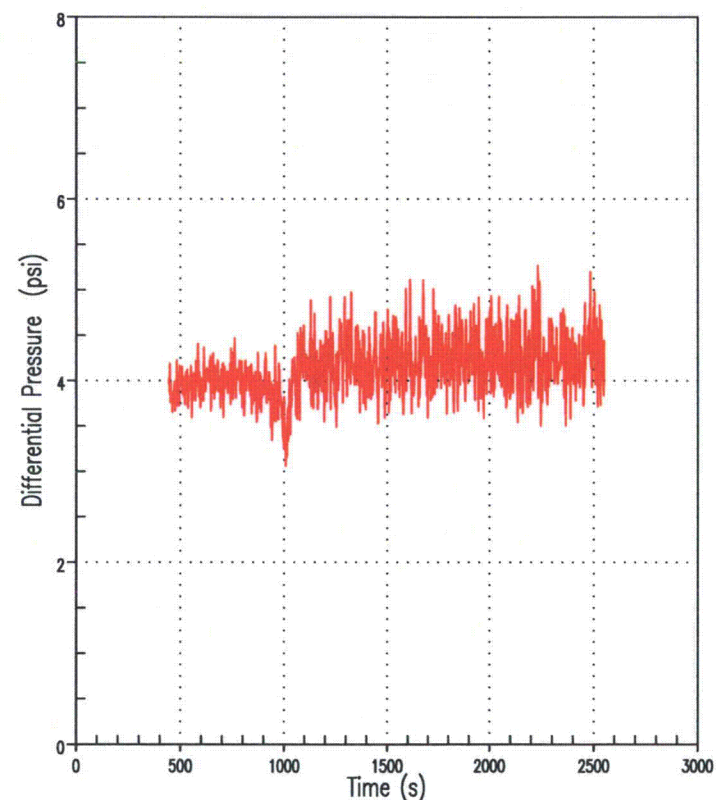
Case 6 – during quasi-steady period restart

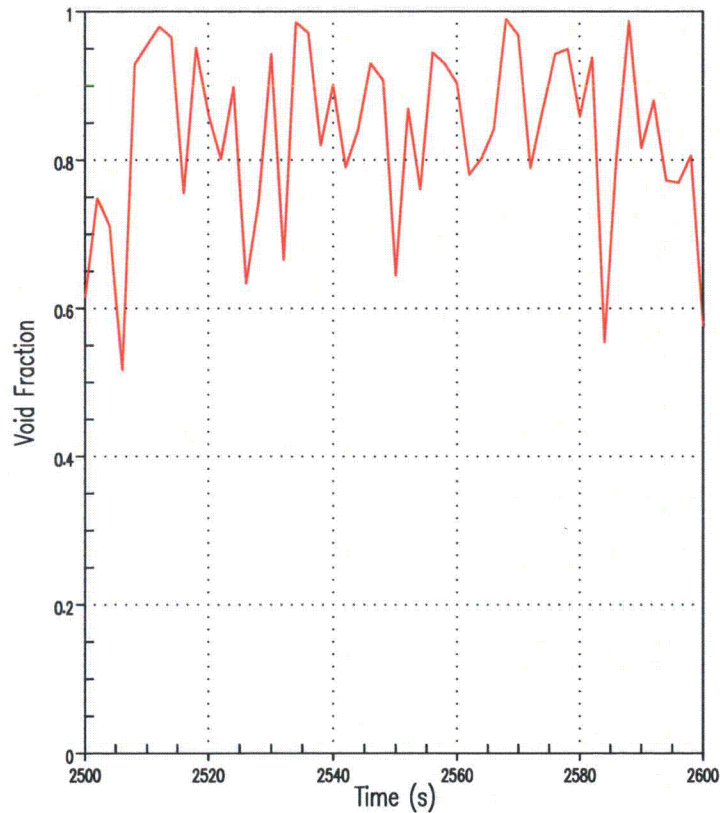AP1000 DEDVI in Loop Compartment: Case 6 K/A2=430.6
Zero is Inside Bottom of Vessel
Downcomer Collapsed Liquid Level

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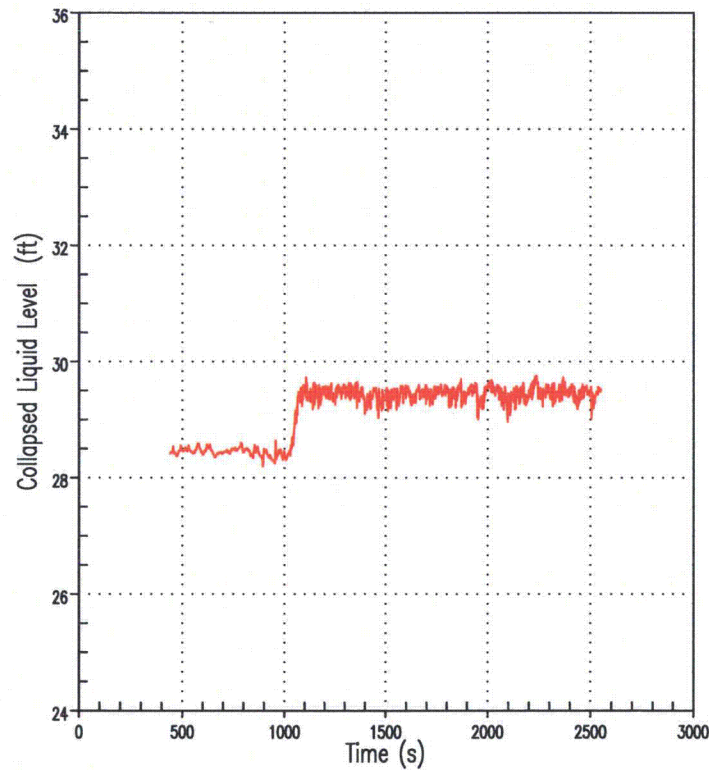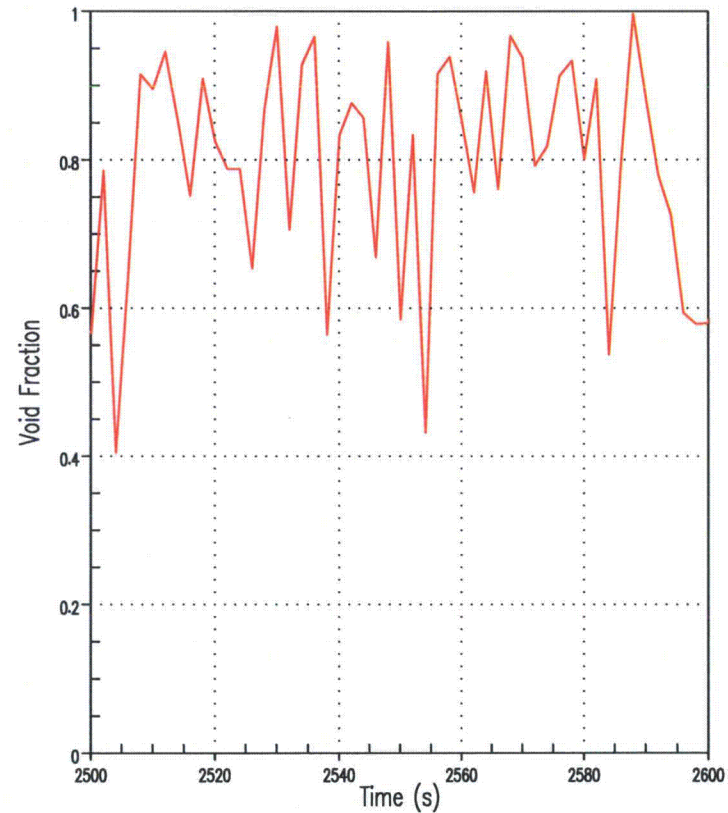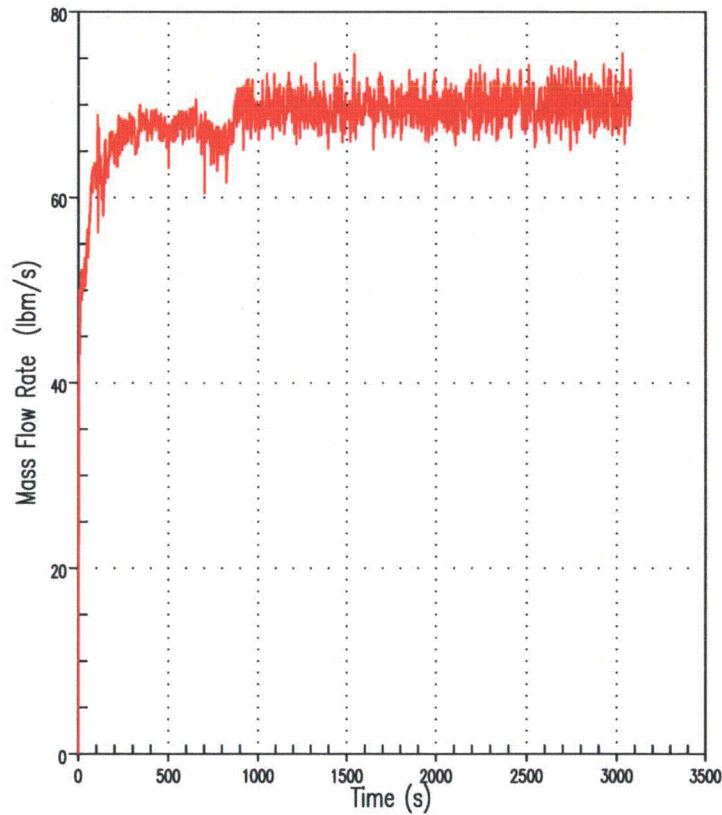
Case 8

AP1000 DEDVI in Loop Compartment: Case 8 K/A2=546.5
Hot Assembly Top Cell Void
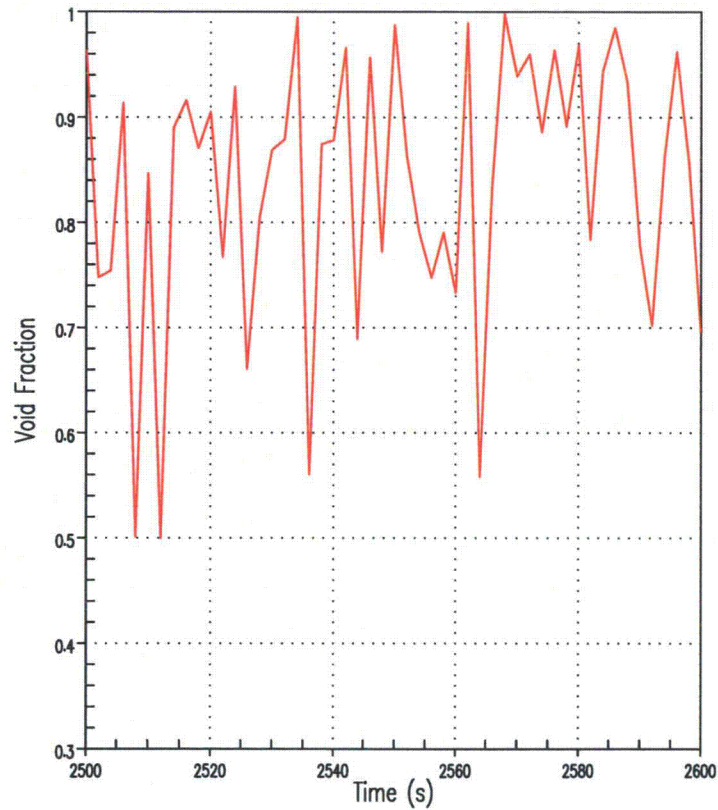
AP1000 DEDVI in Loop Compartment: Case 8 K/A2=546.5
Hot Assembly Second Cell Void
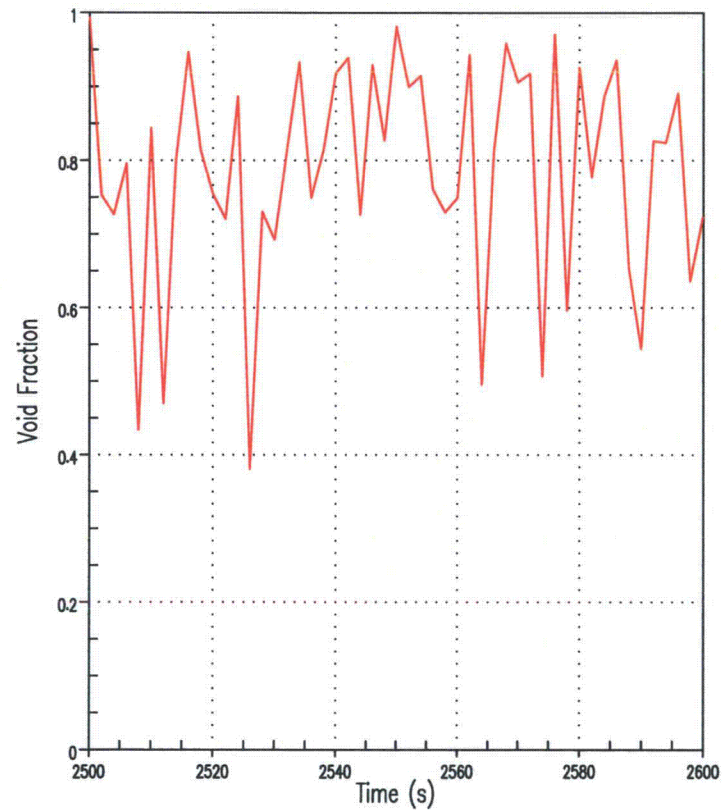
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Case 8 – during quasi-steady period restart

AP1000 DEDVI in Loop Compartment: Case 8 K/A2=546.5
Core Inlet Flow

AP1000 DEDVI in Loop Compartment: Case 8 K/A2=546.5
Core inlet dP

# Case 8 – during quasi-steady period restart

AP1000 DEDVI in Loop Compartment: Case 8 K/A2=546.5
Zero is Inside Bottom of Vessel
Downcomer Collapsed Liquid Level

Case 9

AP1000 DEDVI in Loop Compartment: Case 9 K/A2=645.8
Hot Assembly Top Cell Void

AP1000 DEDVI in Loop Compartment: Case 9 K/A2=645.8
Hot Assembly Second Cell Void

Case 9

AP1000 DEDVI in Loop Compartment: Case 9 K/A2=645.8
Core Inlet Flow

AP1000 DEDVI in Loop Compartment: Case 9 K/A2=645.8
Core inlet dP
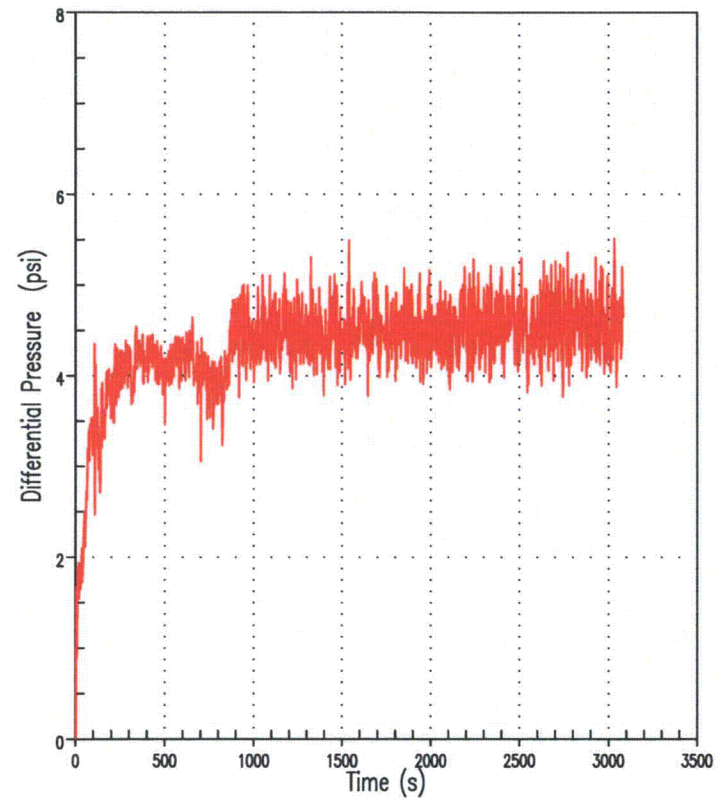
Case 9

AP1000 DEDVI in Loop Compartment: Case 9 K/A2=645.8
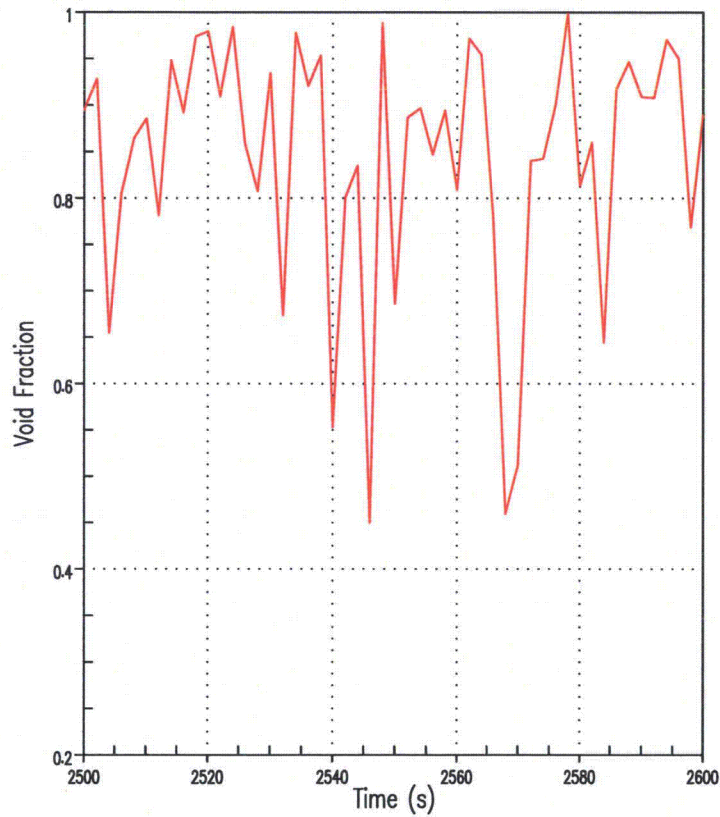Zero is Inside Bottom of Vessel
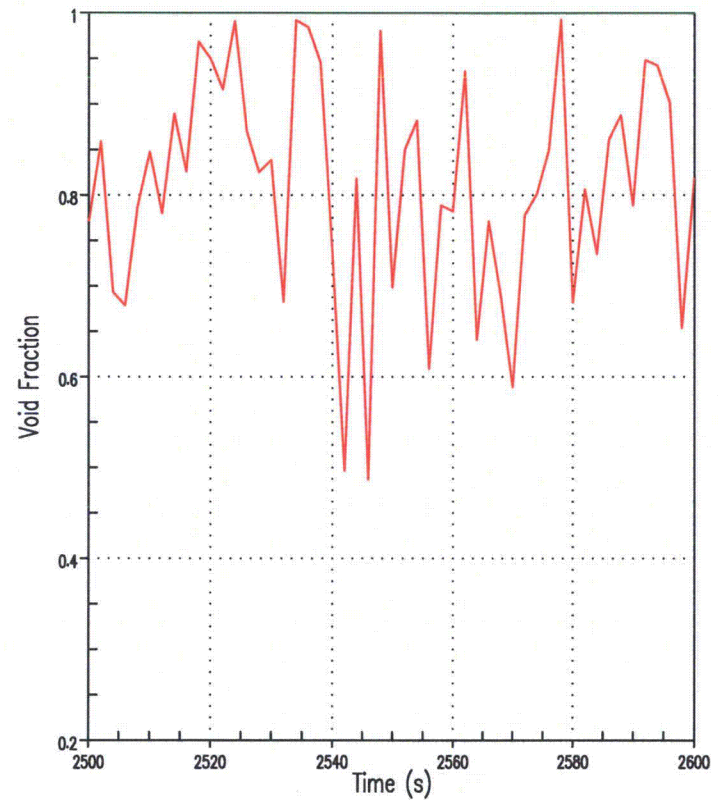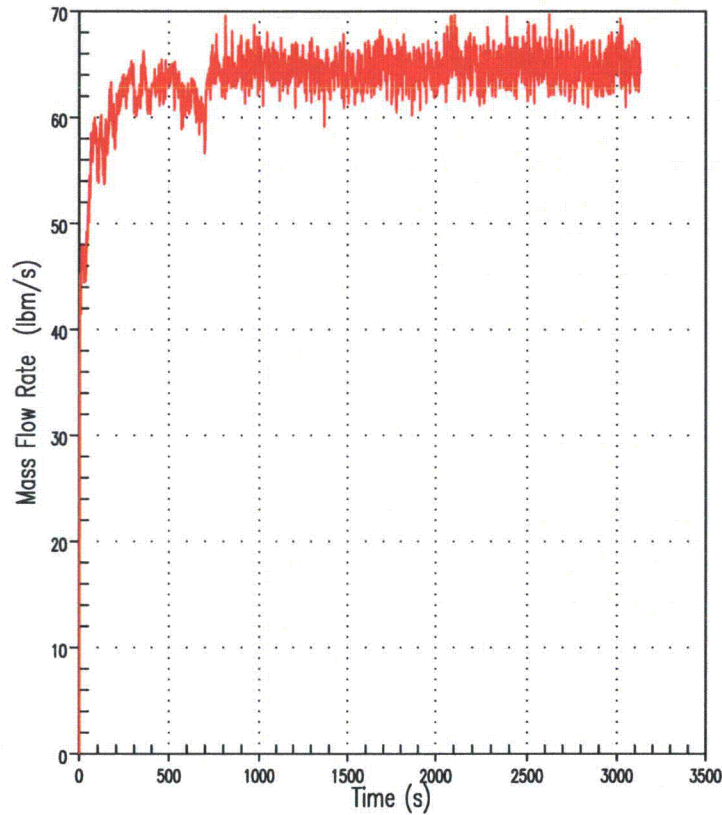— Downcomer Collapsed Liquid Level

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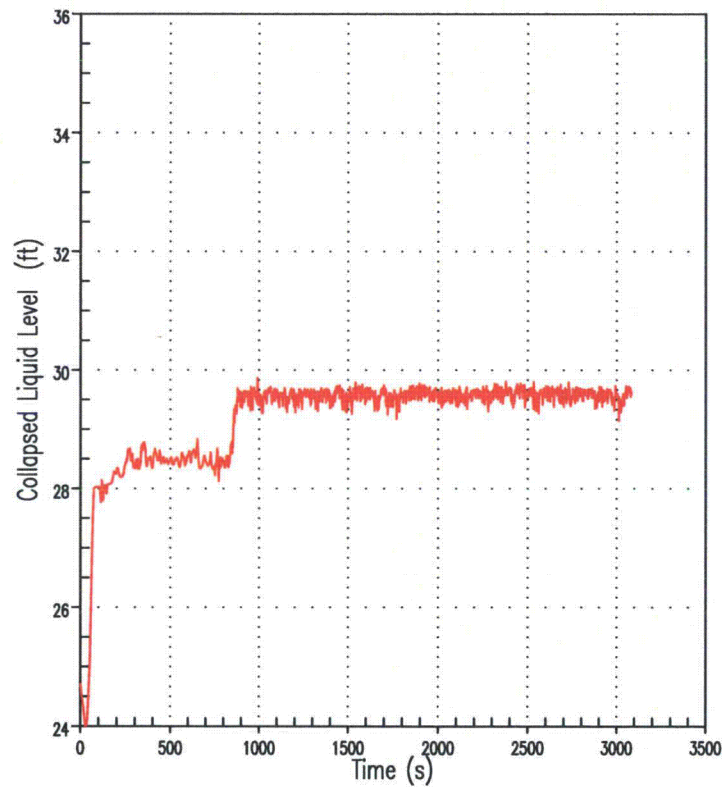
Case 10

AP1000 DEDVI in Loop Compartment: Case 10 K/A2=761.8
Hot Assembly Top Cell Void

AP1000 DEDVI in Loop Compartment: Case 10 K/A2=761.8
Hot Assembly Second Cell Void

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Case 10

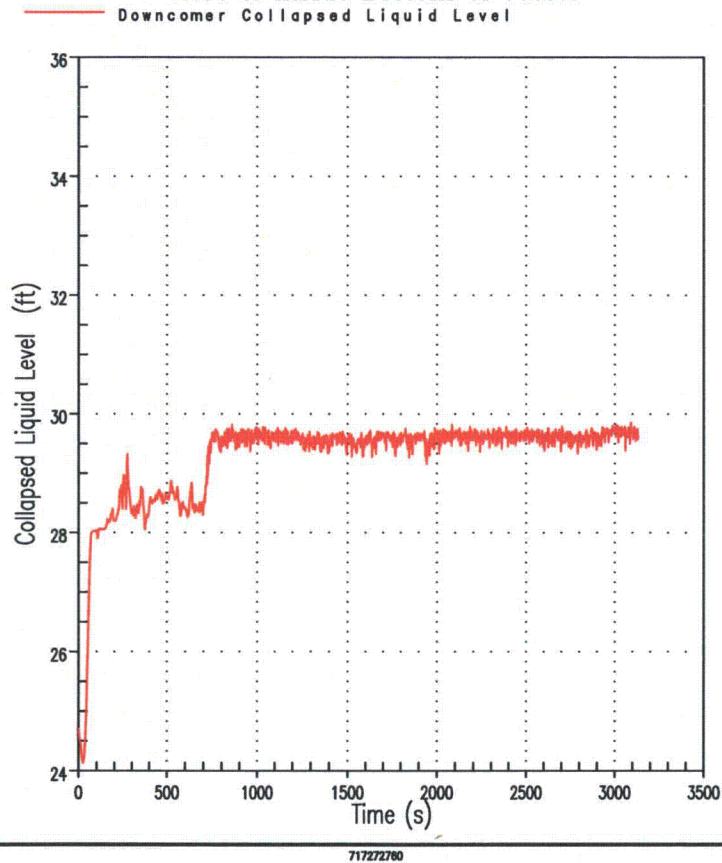AP1000 DEDVI in Loop Compartment: Case 10 K/A2=761.8
Core Inlet Flow

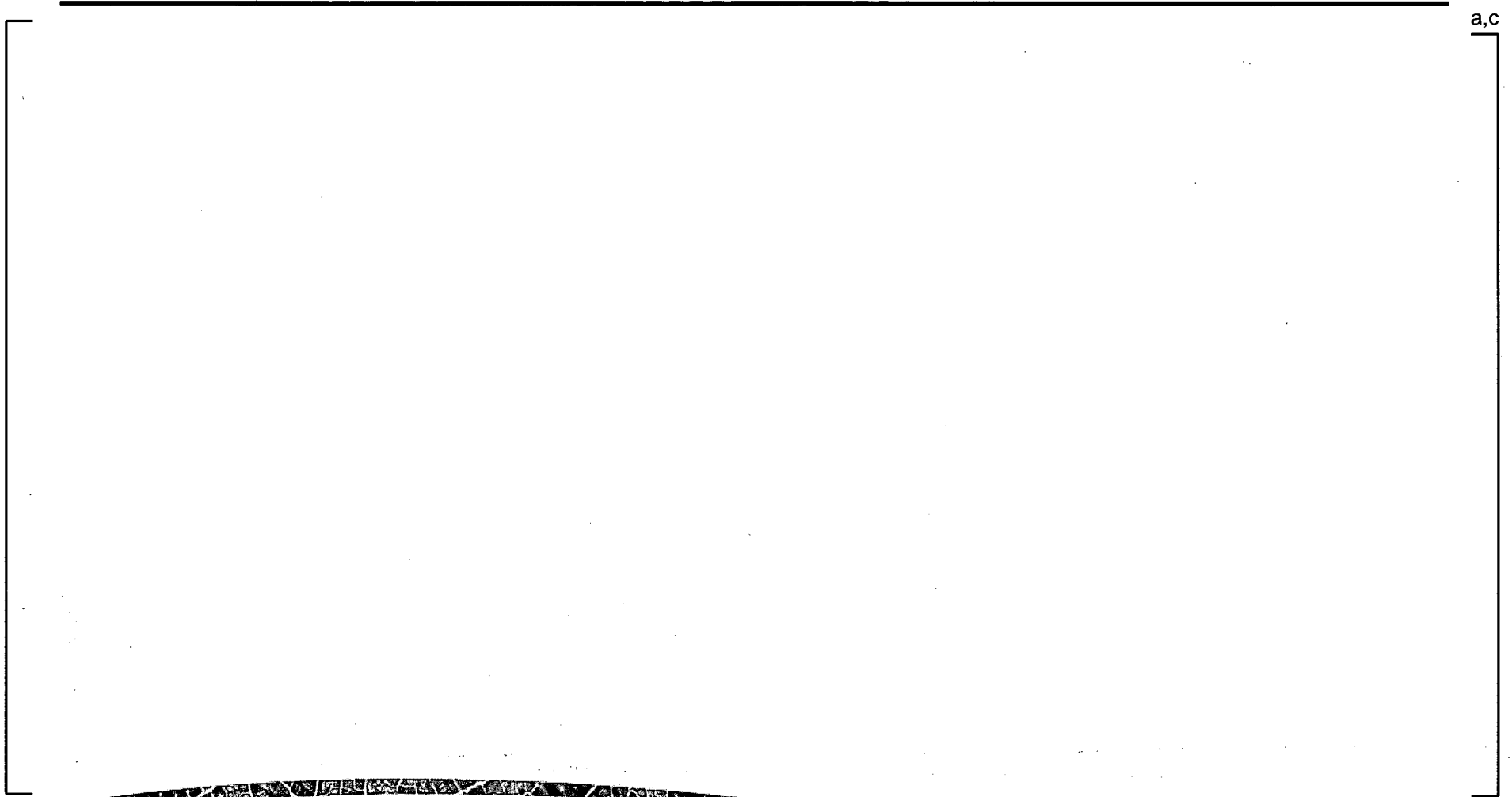AP1000 DEDVI in Loop Compartment: Case 10 K/A2=761.8
Core inlet dP
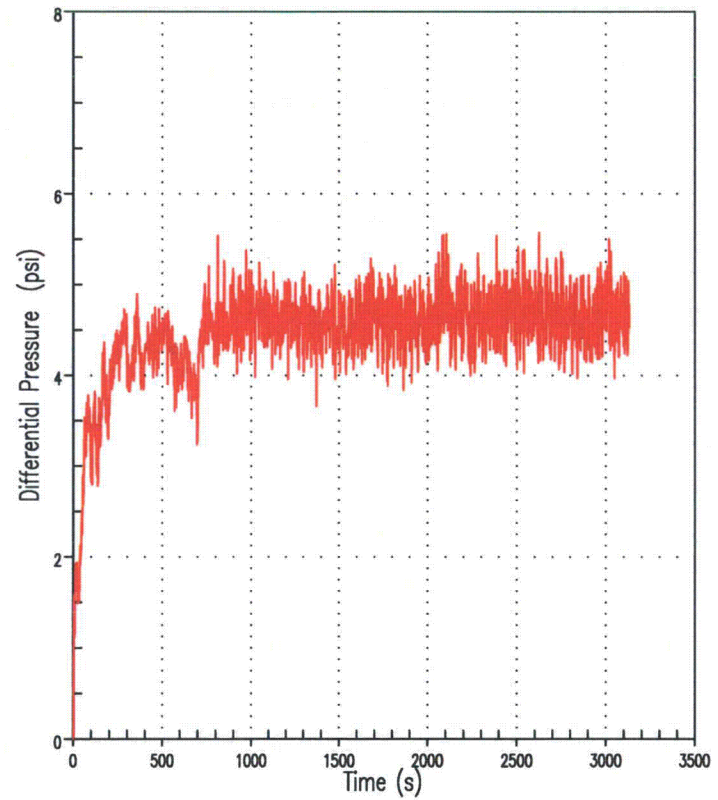
Case 10

AP1000 DEDVI in Loop Compartment: Case 10 K/A2=761.8
Zero is Inside Bottom of Vessel

Downcomer Collapsed Liquid Level
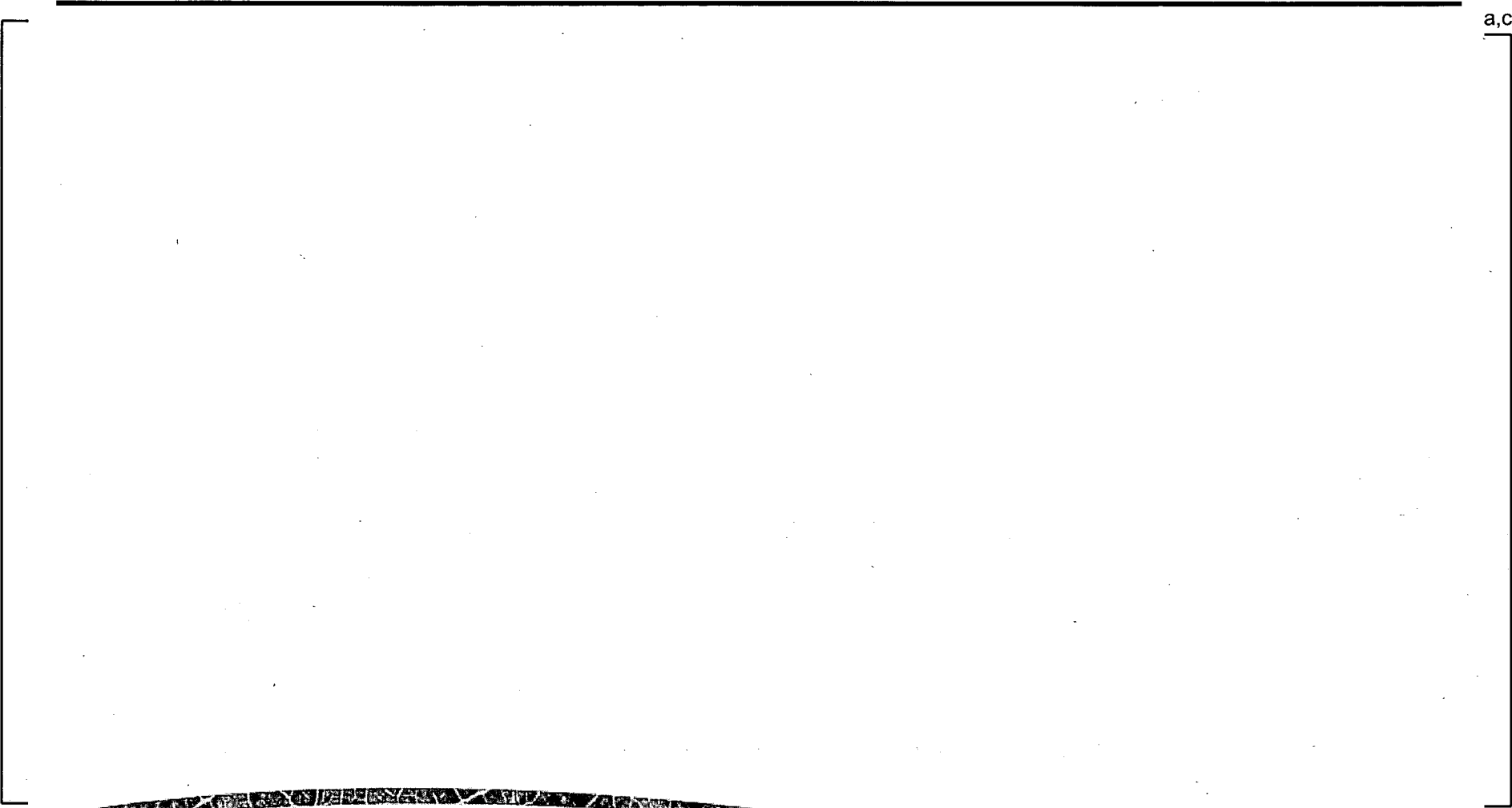
New Case 1

a,c

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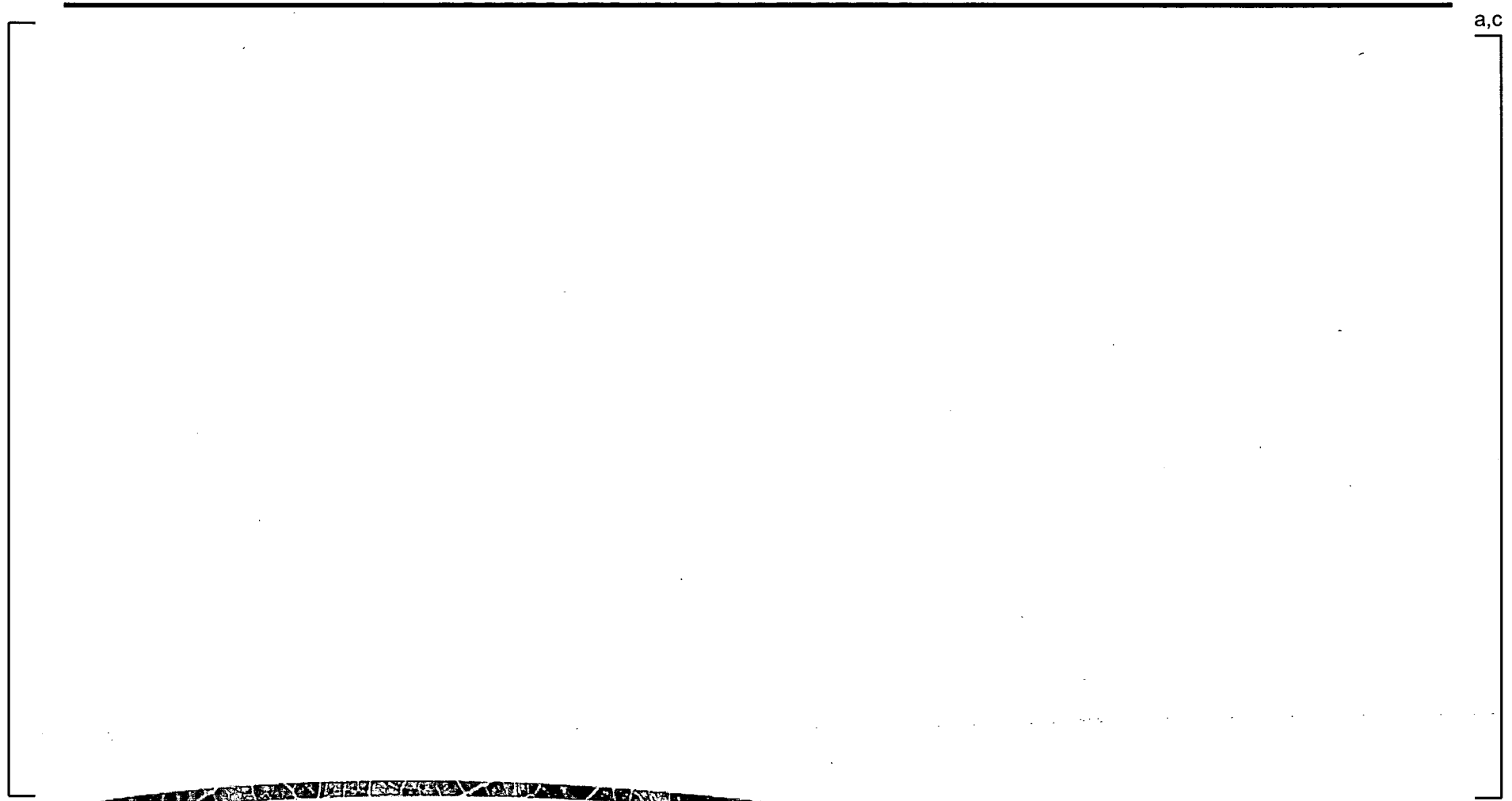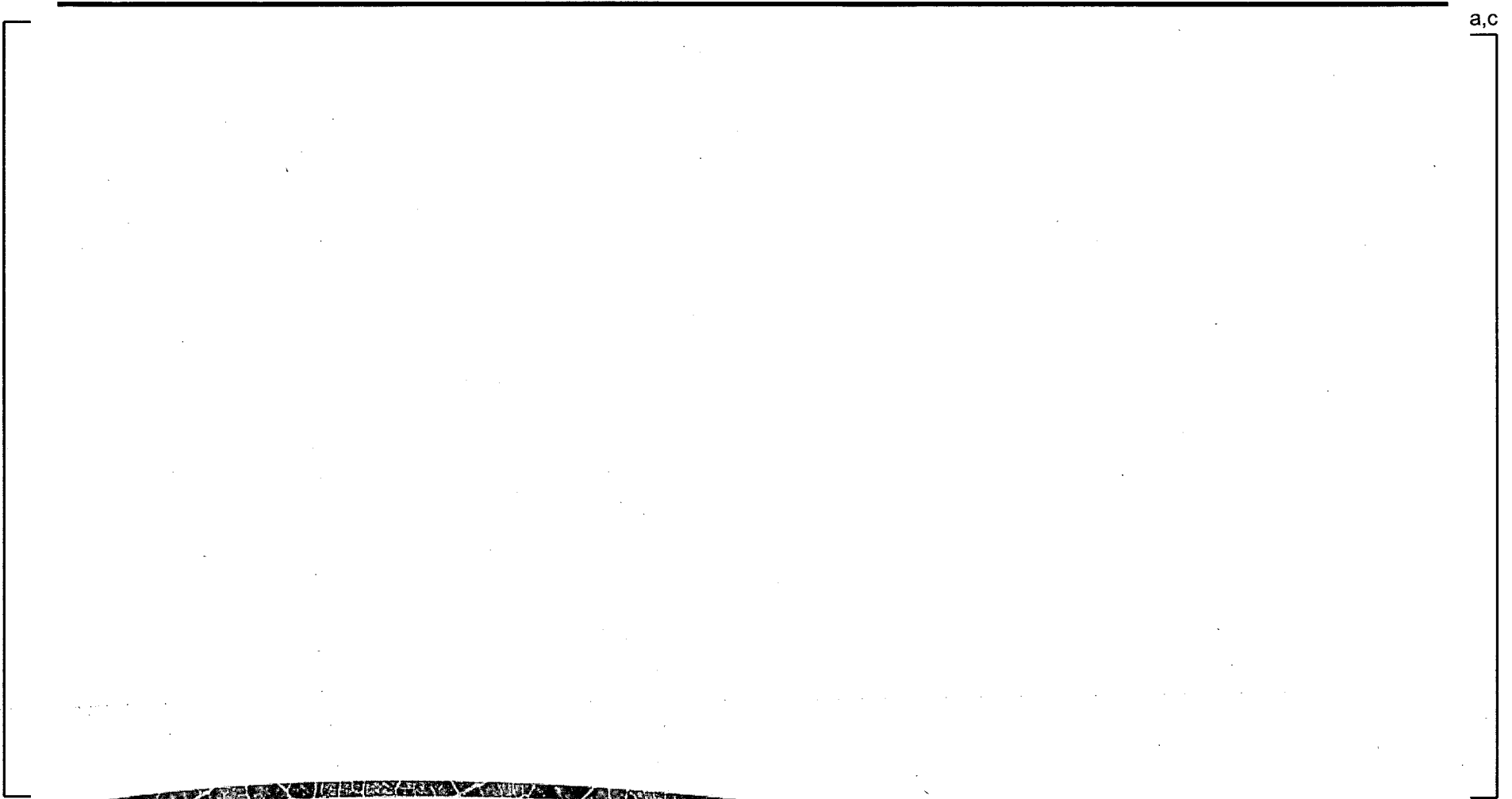# New Case 1
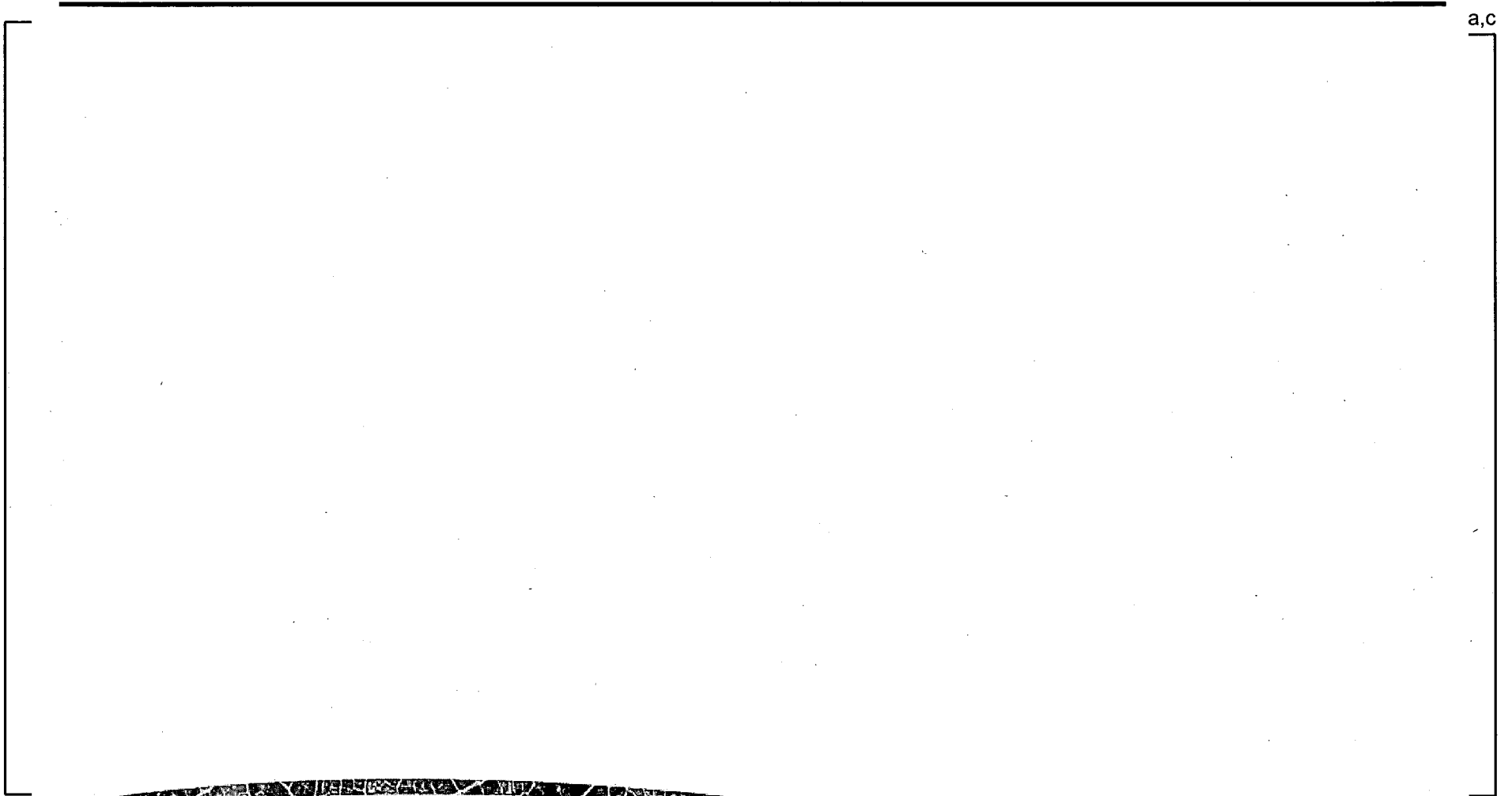
a,c

New Case 1

a,c

New Case 2

a,c

New Case 2

a,c

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New Case 2

a,c

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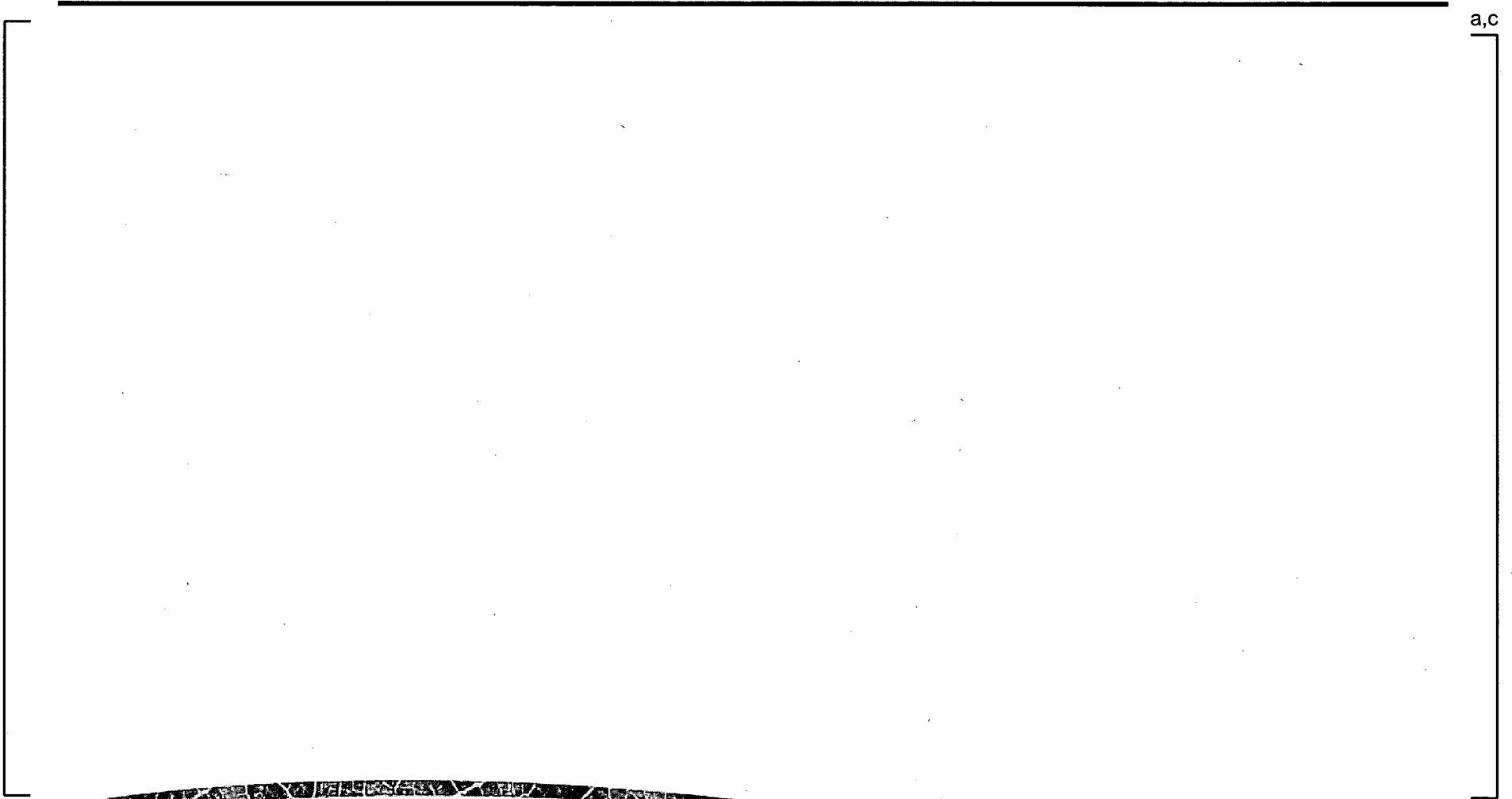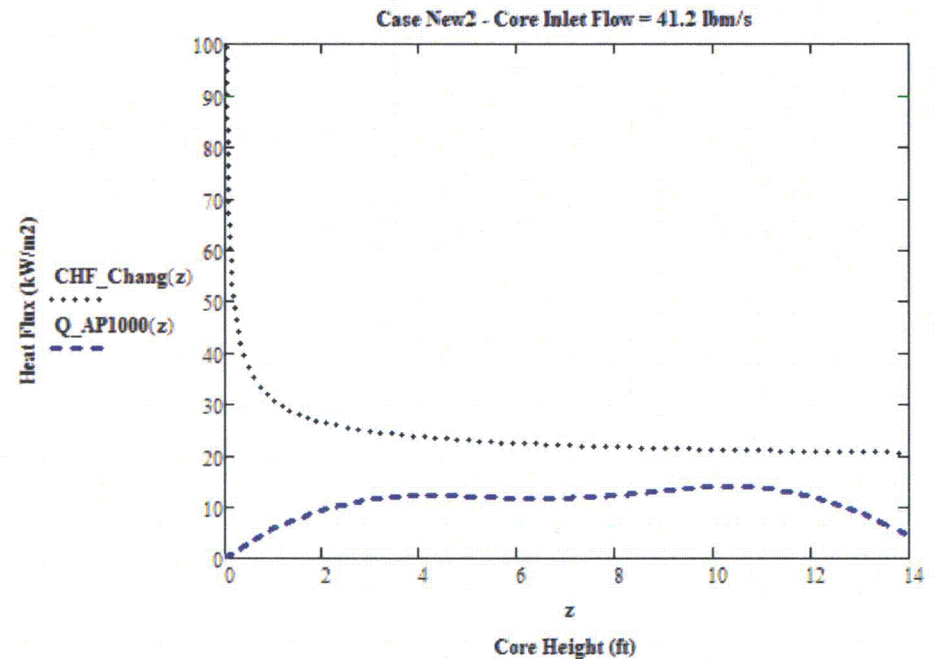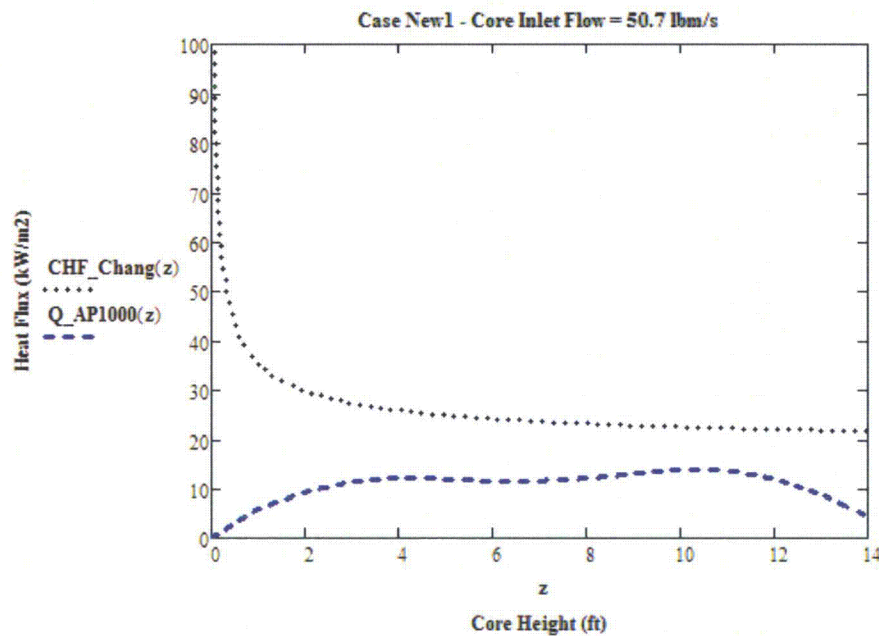
Confirmation of CHF Results in <u>W</u>C/T LTC Results

- CHF check against Chang (1991) correlation for New Case 1, New Case 2
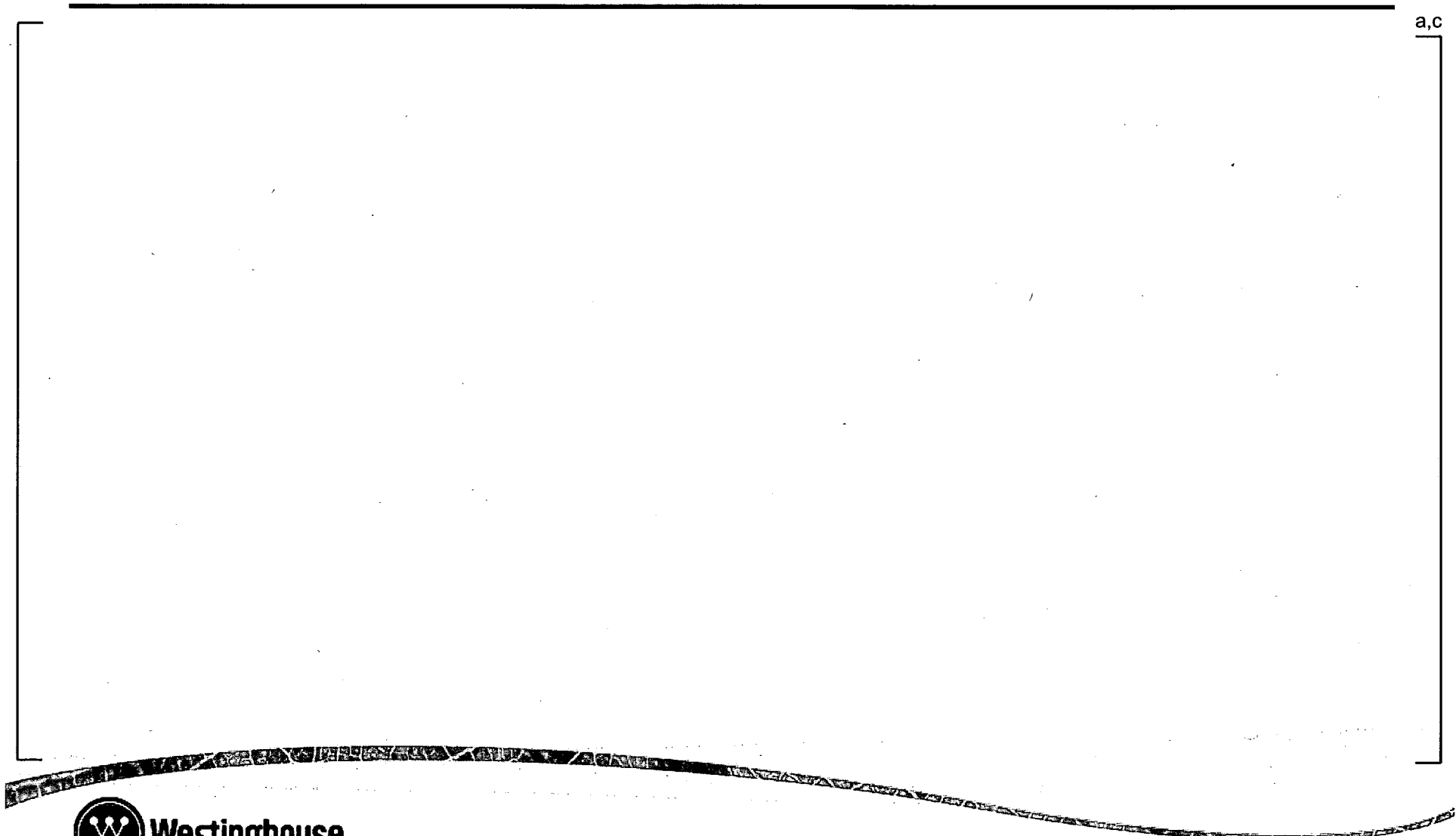
CHF Comparison – New Case 1, 2

Development of DP vs Fiber Amount

- ## Information on development of DP vs fiber amount

  - – FA debris test data relationship used as input to this evaluation

  - – Approach to using this test data to develop this relationship

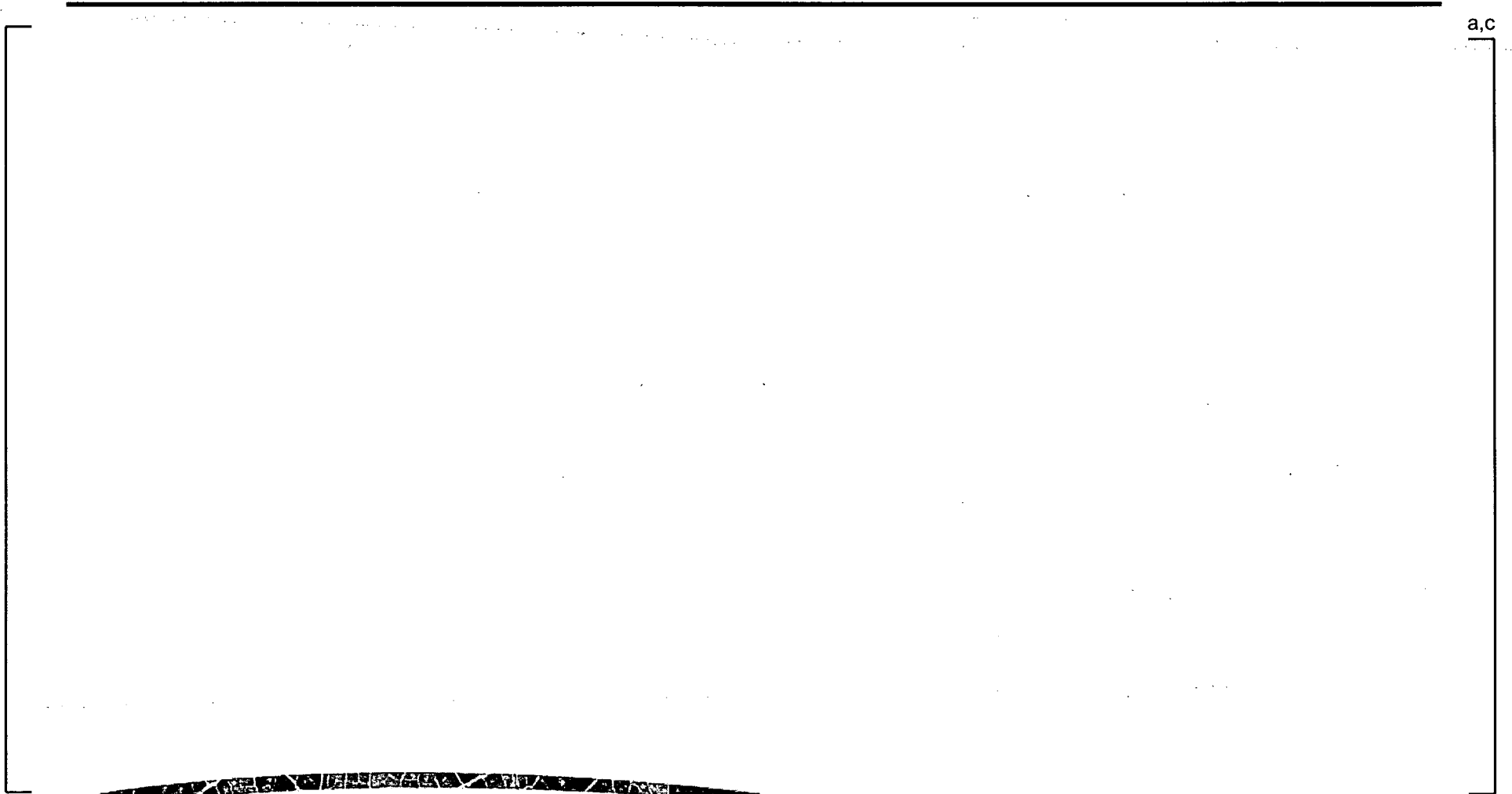# Step 1: PWROG data for cold leg conditions: base-line curve

a,c

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Comparison with AP1000 data from p:f sensitivity tests

a,c

Step 2: extrapolation for 75g of fiber

a,c

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Step 3: extrapolation of the worst dP curve

a,c

Step 4: Comparison whith AP1000 results

a,c