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SUBJECT: Provides response to request for addl info re proposed TS Amend 136a for pressure boundary redefinition for Westinghouse bybrid expansion joint sleeved tubes.

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May 31, 1996

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Ladies/Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Proposed Amendment 136a to the Kewaunee Nuclear Power Plant Technical Specifications,
Pressure Boundary Redefinition for Westinghouse Hybrid Expansion Joint Sleeved Tubes

References:
1) Letter from C.R. Steinhardt (WPSC) to U.S. Nuclear Regulatory Commission (NRC) dated October 6, 1995

2) Letter from C.R. Steinhardt (WPSC) to U.S. Nuclear Regulatory Commission (NRC) dated November 8, 1995

3) Letter from R.J. Laufer (NRC) to M.L. Marchi (WPSC) dated November 30, 1995

4) Letter from R.J. Laufer (NRC) to M.L. Marchi (WPSC) dated December 13, 1995

5) Letter from R.J. Laufer (NRC) to M.L. Marchi (WPSC) dated January 4, 1995

6) Letter from C.R. Steinhardt (WPSC) to U.S. Nuclear Regulatory Commission (NRC) dated January 8, 1996

040012

7) Letter from C.R. Steinhardt (WPSC) to U.S. Nuclear Regulatory Commission (NRC) dated January 19, 1996

8) Letter from C.R. Steinhardt (WPSC) to U.S. Nuclear Regulatory Commission (NRC) dated May 1, 1996

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9) Letter from R.J. Laufer (NRC) to M.L. Marchi (WPSC) dated May 8, 1996

10) Letter from R.J. Laufer (NRC) to M.L. Marchi (WPSC) dated May 16, 1996

On October 6, 1995, Wisconsin Public Service Corporation (WPSC) submitted a proposed Technical Specification (TS) amendment to redefine the pressure boundary for Westinghouse hybrid expansion joint (HEJ) sleeved steam generator (SG) tubes, reference 1. Supplemental information was provided to the NRC staff on the HEJ crevice chemistry environment and far field residual stress levels for HEJ sleeved tubes on November 8, 1995, reference 2. By letter dated November 30, 1995, the NRC staff requested additional information (RAI) in order to complete review of the proposed TS amendment, reference 3. Our response to the RAl was discussed in a meeting among the NRC staff and representatives from WPSC, Westinghouse and Zetec on December 8, 1995. Reference 4 is a summary of the information presented at that mceting. Subsequent to the December 8th meeting, additional RAIs were received from the staff regarding the abilities and qualification of the eddy current technique proposed for locating the parent tube indications (PTI), reference 5. Our responses to these RAIs were provided in references 6 and 7.

During a mceting with the NRC on January 31, 1996, the staff indicated their preference to have a HEJ pressure boundary definition based on the amount of interference lip between the sleeve hardroll expansion and the elevation at the PTI. On May 1, 1996, WPSC submitted a proposed TS amendment to redefine the pressure boundary for Westinghouse HEJ sleeved SG tubes based on the amount of interference lip remaining in the hardroll lower transition (HRLT), reference 8. By letters dated May 8, 1996 and May 16, 1996, additional RAI's were received from the staff regarding the methodology and qualification of the eddy current technique proposed for locating PTI's, references 9 and 10.

Attachment 1 to this letter provides a written response to questions 1, 2, 3, 4 and 11 from the May 8, 1996, RAI. As requested, this response provides a technical description of the proposed eddy current technique, variables affecting the accuracy of the slewing technique and the protocol for field measurements. We will provide a response to the remaining questions from the May 8, 1996 and May 16, 1996 RAI's in the near future.

As discussed with our NRC Project Manager, we feel that a technical mceting among ourselves, the NRC staff, and Zetec, the probe vendor, would be beneficial to discuss the RAI responses and to address any additional staff questions. We would like to propose a meeting at Zetec on June 17, 1996.

Attachment 2 to this letter contains a revised basis page from the reference 8 submittal. Note 5 on the bottom of page TS B4.2-4 has been changed from WCAP-14640, to WCAP-14641, as well as the accompanying text, to reflect the correct WCAP number. We apologize for this oversight. Please contact a member of my staff if you have any questions or require additional information.

Sincerely,

M. L. Marchi
Manager-Nuclear Business Group

TPO

Attach.

cc - US NRC, Region III
US NRC Senior Resident Inspector
Mr. Lanny Smith, PSCW

ATTACHMENT 1

Letter from C.R. Steinhardt (WPSC)

To

Document Control Desk (NRC)

Dated

May 31, 1996

Response to Request for Additional Information Related to Proposed Technical Specification Amendment 136a: Pressure Bouudary Redefinition for Westinghonse HEJ Sleeves

This attachment provides responses to questions 1, 2, 3, 4 and 11 from the request for additional information (RAI) dated May 8, 1996. The response for questions 5 through 10 from the May 8, 1996 RAI will be provided in conjunction with our response to the May 16, 1996 RAI. This information will be submitted in the near future.

<u>NRC Question 1 (May 8, 1996)</u>

Provide a detailed explanation of the nondestructive examination (NDE) program including, but not necessarily limited to, a description of the NDE methodology, qualification program, variables affecting probe precision, quality assurance checks and in-field calibrations, performance demonstration, and slewing process (for displaying the bobbin profile data on the same plane as the plus-point data).

<u>Response to Question 1</u>

For tubes in which parent tube indications (PTIs) are detected, the NDE technique will measure the diameter change between the ID of the sleeve at the maximum point of the sleeve hardroll and the ID of the sleeve at the elevation of the PTI. A combination probe head utilizing motorized rotating probe technology was developed for this inspection. The probe contains two bobbin coils spaced 1.25 inches apart. These coils are used to verify consistent translation speeds and to perform profilometry measurements of the sleeve hardroll and hydraulic expansion regions. The bobbin coils operate in the absolute mode to provide these measurements. A +Point™ coil is placed between the two bobbin coils, equidistant from each bobbin coil at a distance of 0.625 inches. The +Point coil is specifically designed for sleeve inspections and was previously qualified in accordance with Appendix H of the EPRI PWR Steam Generator Examination Guidelines for the detection of PTIs in Westinghouse Hybrid Expansion Joint (HEJ) sleeves. Figure 1 shows a drawing of the +Point/2Bobbin combination probe as well as a 2Bobbin reference probe.

A consistent digitization rate is required for an accurate and repeatable realignment, or slew, of the bobbin profile data with the +Point data. Digitization rate, or the number of digital samples per inch of surface inspected, is dependent on instrument sampling rate and scanning speed. When using MRPC technology, the scanning speed must be addressed in both the circumferential (probe RPM) and axial (probe push speed) directions. Selection of these parameters determines the number of samples per inch, both axially and circumferentially. The parent tube ID diameter of 0.775 inch was selected for digitization rate and frequency selection (0.775 inch is the approximate mid diameter of the sleeve and the parent tube). A sampling rate of approximately 0.020 inch, in both axial and circumferential directions, was selected to ensure adequate coverage throughout the area of interest. Testing was performed with the following parameters:

Rotation Speed: 500 rpm
Sampling Rate: 1280 samples per second
Axial Translation Speed: 0.15 inch/second.

Examination frequencies of 600 kHz, 300 kHz, 120 kHz, 100 kHz and 75 kHz were selected to provide flaw detection in both the sleeve and parent tube and profile information on the sleeve inside diameter. A standard consisting of three drill holes spaced nominally 0.625 inches apart, to match the coil spacing, was constructed (Figure 2). The combination probe was pushed through this standard at the parameters listed above. Figure 3 illustrates the probe translation as it is pushed through the standard. The upper, or leading, bobbin coil detects the third drill hole at the same time both the +Point coil detects the second drill hole, and the lower, or trailing, bobbin coil is detecting the initial drill hole. A data slewing process was performed to verify the data from all three coils can be aligned as if they each detected the flaw simultaneously. A description of the data slewing process, along with examples from the testing, is covered in response to question 2. Results from testing with the three-hole standard confirmed that the data from the bobbin coils can be slewed to "overlay" the bobbin profile concurrent with the +Point data.

Following development of the probe concept and testing parameters, tests were performed with actual HEJ specimens which contained flaws in the hardroll lower transition (HRLT). Data from all three coils was slewed such that each coil appeared to detect the flaw simultaneously. An improper slew, due to a variable such as inconsistent probe speed, would be cause for rejection of the data and require a retest. With a correct data slew, the analyst locates the peak amplitude of the PTI. This is accomplished with the +Point coil, at a frequency of 100 kHz, within a C-scan MRPC plot. Axial and circumferential cursors can be positioned within the C-scan plot to intersect over the peak amplitude of the PTI (refer to our forthcoming response to question 10).

With the cursor properly positioned, a diameter measurement is recorded of the sleeve ID at the elevation corresponding to the peak amplitude of the PTI. The bobbin coil, operating in an absolute mode at 600 kHz, is used for the measurement in order to minimize any influence from the parent tube. A diameter measurement is also recorded at the largest diameter found within the sleeve upper hardroll. The difference between these measurements, referred to as a ΔD, is then calculated for comparison to the acceptance criteria.

Tests were performed using eight HEJ specimens which contained flaws in the hardroll lower transition (HRLT). The samples were fabricated to be representative of the Kewaunee Nuclear Power Plant (KNPP) sleeves which have experienced roll down of the HRLT, along with samples fabricated with no roll down. Flaws approximately 40% throughwall from the parent tube OD and 360 degrees around the tube circumference were created at various elevations within the HRLT. Each sample was tested four times, twice pushing and twice pulling the probe to determine both the repeatability of the proposed technique as well as the preferred scanning direction. An axial encoder for ensuring consistent translation speeds was not employed for this testing. A comparison of diameter measurements between data collected on the push and data collected on the pull indicate that more accuracy and consistency is gained collecting data on the push. Pushing eliminates the inconsistent probe speeds caused by slack in the probe's poly tubing within the conduit, which can happen when data is collected while pulling the probe. Also, geometry changes within the tubing (i.e. expansions, hardrolls) are transversed at a consistent speed, as opposed to pulling the data, where gravitational forces have an effect.

Two types of analyses were performed on the collected data to determine the most accurate analysis technique. First, data slewing was performed only on the initial sample in a calibration group and retained through each subsequent test. The analyst was required to check the accuracy of the slew by comparing the strip chart profiles of the two bobbin coils. If the data slew was accepted (no variation between the two bobbin profiles), diameter mcasurements were taken at the elevation of the PTI and at the maximum hardroll diameter. The second type of analysis performed involved data slewing for each sample in a calibration group. The results are shown in Table 1.

TABLE 1

Analysis Technique	Measurement Variation Between Successive Tests		
	PTI Elevation Diameter	Maximum Hardroll Diameter	ΔD
Initial (First Time) Slew	0.0000 to 0.0011	0.0000 to 0.0002	0.0001 to 0.0010
Individual Slew	0.0000 to 0.0004	0.0000 to 0.0001	0.0001 to 0.0005

When data slewing was performed only on the initial sample in a calibration group and retained through each subsequent test, the PTI elevation diameters varied between 0.0000 and 0.0011 inches between successive tests on the same sample, the hardroll diameters varied between 0.0000 and 0.0007 inches, and the ΔD varied between 0.0001 and 0.0010 inches. When the data was slewed for each sample in a calibration group, the PTI elevation diameters varied between 0.0000 and 0.0004 inches betwcen successive tests on the same sample, the hardroll diameters varied between 0.0000 and 0.0001 inches, and the ΔD varied between 0.0001 and 0.0005 inches. The results of testing show there is less variation in diameter measurements when the data is slewed for each sample in a calibration group.

Variables affecting the precision of the probe include translation speed, coil spacing, probe wear, calibration standard accuracy and analyst variability. Our response to questions 2 and 3 discusses each of these variables and how each of these variables will be controlled.

Quality assurance checks, performance demonstration and in-field calibrations are discussed in our response to question 3.

Based on the information above we can conclude the following:

- Measuring diameters using the slewing techniques discussed above show good repeatability. Data showing repeatability of bobbin diameter measurements using different probes and different analysts will be discussed in our forthcoming response to question 7.

- More accuracy is gained by slewing the bobbin data for each individual sample as opposed to slewing for the original sample and requiring a "slew quality" check during each successive tube. Therefore, during analysis of HEJ data in the field, the analysis guidelines will require a slew of the bobbin data for each tube. Additionally, software is being written which will overlay the two bobbin strip chart responses. An analyst will be able to move the strip chart response of one coil until it coincides with the second coil. If a consistent speed was maintained through the test, the resultant will be a single line. Present consideration for a rejection criteria is any time the two responses do not coincide. Further information regarding rejection criteria for the bobbin profile overlays will be provided in our forthcoming response to question 3 from the May 16, 1996, RAI.

- The data analysis guidelines will incorporate specific guidance for the analyst to recognize irregular push speeds, and the use of an axial encoder and probe tensioner will be employed to ensure consistent translation speeds.

- A comparison of diameter measurements between data collected on the push and data collected on the pull indicate that more accuracy and consistency is gained collecting data on the push. Therefore, all combination probe data will be collected on the push.

- Variables which may affect the accuracy of the data slewing process can be controlled to minimize the NDE uncertainty. An overall assessment of the NDE uncertainty is provided in our forthcoming response to question 5.

NRC Questiou 2 (May 8, 1996)

Identify and explain all potential variables (e.g., variations in probe speed, coil spacing (consistent with dimensional tolerances), probe wear, calibration standard variances (within dimensional tolerances, human factors, etc.) affecting the accuracy of the slew (i.e., the degree to which the bobbin diameter data correspond to the exact location of the plus-point data). This definition of "accuracy of the slew" is different from the one given in previous discussions which simply referred to how well the slewed profiles from each bobbin coil line up with one another, or how much they are "offset."

NRC Question 3 (May 8, 1996)

Explain how each of the variables affecting the accuracy of the slew is to be controlled. This should include an explanation of the use of an axial encoder for ensuring consistent translation speeds and should address the range of speeds which will be permitted? Regarding coil spacing, how well (quantitatively) can this be controlled with the use of the calibration standard, considering its dimensional tolerances and also considering the different "look ahead" characteristics of bobbin coils versus plus-point coils. Will the use of the calibration standard to control coil spacing be demonstrated by performance demonstration? Provide comparative, quantitative information on the look-ahead characteristics of bobbin and plus-point coils. Explain what will be done if a combination probe fails to meet calibration test criteria.

Response to Questions 2 and 3

For eddy current probes that contain coils positioned at different axial locations along the probe head, flaw responses will vary as each coil passes over the flaw location. The data display will show an offset in flaw response from one coil to the next. The +Point/2Bobbin probe head developed for Kewaunee's HEJ sleeves is an example of this type probe. Eddynet software provides the ability to slew the data, thus eliminating the offset caused by coil separation. After the data is slewed, each coil's response can be viewed as if they occur simultaneously.

Data slewing involves the movement and realignment of data slices for one coil by selecting "From" and "To" locations. A data slice includes all data recorded for all frequencies at a given moment in time. The frequency at which these data points are recorded is set within the eddy current test instrument as samples per second. The data slices are numbered consecutively and recorded to the recording media. A consistent digitization rate is required for an aecurate and repeatable slew. Probe coil spacing, probe wear, calibration standard accuracy and analyst variability all contribute to slew accuracy.

An analyst positions the cursor within the data to where they want to slew the data from. The data slice value at that cursor location is retained by the software. Next the cursor is placed where the data is slewed to. This data slice value is also retained in the software. Lastly, the analyst activates the data slew. The software calculates the difference in data slices and slews the data that value. For the +Point/2Bobbin probe the data is slewed such that responses for each coil are concurrent.

Figure 4 shows the strip chart displays for each of the bobbin and +Point coils. Knowing that the data was recorded while pushing the probe through the standard containing three drill holes, we can see from the cursor position (designated as TSH) that bobbin coil 5 (C5) is passing over the third drill hole while bobbin coil 7 (C7) is just passing over the first drill hole. Also note that the +Point coil (C1) is at the second drill hole. In order to slew the +Point data we first define a start point. In this example the point at which the +Point coil is over the first drill hole is chosen (Figure 5). The Data Slew Menu box shows the cursor position to be at data slice #44810. Next a point to slew the data to is chosen. The cursor position in Figure 6 is where bobbin C5 passes directly over the first drill hole, at slice #39727. Activating the data slew for +Point coil #1 repositions the data so that it appears to occur in time with C5. The data slewing process is repeated for bobbin coil 7. The Data Slew Menu box in Figure 7 shows the From/To data slice values of #49567 and #39780, respectively. With the data slews activated for coils 1 and 7, we can see from the strip charts in the figure that responses from each drill hole appear to occur simultaneously.

The accuracy of the data slewing process may be affected by a finite number of variables, including probe translation speed, coil spacing, probe wear, calibration standard accuracy and analyst variability. These variables will be controlled in a manner to minimize discrepancies in the process, and provide repeatability within the testing.

A consistent axial speed through the test specimen is necessary to develop an accurate slew. The speed is controlled by a series of methods. First, all data will be recorded while pushing the probe. Pushing eliminates the inconsistent probe speeds caused by slack in the probe's poly tubing within the conduit, which can happen when data is collected while pulling the probe. Also, geometry changes within the tubing (i.e. expansions, hardrolls) are transversed at a consistent speed, as opposed to pulling the data, where gravitational forces have an effect. Secondly, an axial encoder will be used to verify push speed. Presently, Eddynet®95 software provides the ability to set a scale between encoder pulses. Inconsistent speeds of a large magnitude can be detected from observing the strip chart responses of the encoder. The analysis guidelines and analyst training program will contain instructions to retest the area of interest if the number of revolutions per pulse falls outside the range of 1.2 to 3.2. This ensures a consistent translation speed for every 0.018 inches of axial distance traveled. For those pull speeds which fall within the revolution per pulse range, the scale will be used to check for consistency. In addition, a probe tensioning device within the encoder assembly will be incorporated into the system to assist in ensuring consistent probe speeds. The tensioning device applies a constant force to the probe's poly tubing, minimizing any slippage of the probe.

The +Point/2Bobbin combination probes will be manufactured in accordance with Zetec QA/QC manufacturing procedures. Tolerances for coil spacing will be kept to a minimum, ±0.002 inches. In addition, each probe will be tested with a three hole standard prior to use in the field to verify proper coil spacing. Each drill hole in the standard is spaced 0.625 ±0.002 inches apart to match the spacing of the probe coils. The measured as-built dimensions for the three hole standard used for this qualification is 0.626 inches, centerline to centerline of each drill hole. Thus far, Zetec has manufactured two +Point/2Bobbin probe heads. Each was pushed through the standard ten times at 0.15 in/sec at 500 rpm. The point at which each coil "peaked" over the drill holes was compared.

For both probe heads the two bobbin coils reached their maximum deflections in unison, while the +Point coil lagged in time. This result is not due to variances in coil spacing, but is due to the gimbaled design. The design allows the coil to articulate over the inner diameter with minimal resistance. Therefore, a slight "tilt backwards" occurs due to frictional forces applied at the sleeves inner diameter. Table 2 displays the amount of data points the +Point coil trailed the bobbin coil for each of the ten tests.

TABLE 2

Data Point Offset Between +Point and Bobbin		
Run	Probe 1	Probe 2
1	95	45
2	80	185
3	95	180
4	125	170
5	60	175
6	65	155
7	40	180
8	185	170
9	165	160
10	165	160
Average	107.5	158.5

Using the test parameters identified in our response to question 1, the linear distance between sample points is calculated as follows:

$$\frac{(\pi) \times (0.775 \text{ inch}) \times (500 \text{ rpm}) \times (1 \text{ min})}{(1280 \text{ samples/sec}) \times (60 \text{ sec})} = 0.015 \text{ inch/sample}$$

The number of rotations in one inch of tube is:

$$\frac{(500 \text{ rpm})}{(60 \text{ sec}) \times (0.15 \text{ inch/sec})} = 55.55 \text{ rev/inch}$$

The distance traveled in one revolution is:

$$\frac{(0.15 \text{ inch/sec}) \times (60 \text{ sec})}{(500 \text{ rpm})} = 0.018 \text{ inch/rev}$$

The number of samples per revolution is:

$$\frac{(1280 \text{ samples/sec}) \times (0.018 \text{ inch/rev})}{(0.15 \text{ inch/sec})} = 153.6 \text{ samples/rev}$$

Converting the average number of data points for both coils to axial distance gives 0.0125 inch for coil 1 and 0.0185 inch for coil 2. These offsets are minimal and will be compensated for by the data slewing process.

Probe wear will be controlled by comparison of pre- and post-standard runs. An HEJ standard with an EDM notch will be used to verify repetition of signal amplitudes. By testing this standard after every 10 tubes, the initial amplitude measurements of the flaw will be compared to subsequent tests. Probe changes will be required whenever the voltage readings differ by more than 15 pereent.

Analysis variability also will be controlled to provide repeatable results. In order to achieve consistent data slews from analyst to analyst, a couple of variables will be addressed in the analysis guidelines. First, the span setting of the data will be increased; and second, the zoom function will be applied at a setting of 10 at the area of interest. A zoom setting of 10 places one-tenth the amount of data collected for that tube into the strip chart (Figure 8). By increasing the signal amplitude and minimizing the number of data points in the strip chart, an analyst's consistency in selecting the peak response of each coil is increased. Data showing repeatability of bobbin diameter measurements using different analysts will be discussed in our forthcoming response to question 7. In addition, Zetec is currently writing software to further control analyst variability (refer to our response to question 4).

In summary, the accuracy of the data slewing process may be affected by a finite number of variables, including probe translation speed, coil spacing, probe wear, calibration standard accuracy and analyst variability. Probe translation speed is controlled through the use of both an axial encoder and probe tensioner to ensure consistent translation speeds. Coil spacing is controlled during probe manufacture and verified prior to use in the field with the three hole standard. Probe wear is controlled by comparison of pre- and post-standard runs. The accuracy of the three hole calibration standard has been verified as 0.626 inches, centerline to centerline of each drill hole. Analyst variability is controlled through requirements on span and zoom settings within the analysis guidelines, as well as software changes currently underway to further control analyst variability in both verification of probe translation speeds and proper slew.

NRC Question 4 (May 8, 1996)

Describe the procedures and criteria for determining the adequacy of the offset between the slewed bobbin profiles. What action is to be taken in the event of an unaeceptable offset?

Response to Question 4

Zetec is currently writing software to simplify the data slewing process. The concept is to relate data points back to a linear axial distance. This software in conjunction with an axial encoder permits verification of translation speeds. Projected software completion date is mid-June.

Additionally, software is being written which overlays the two bobbin strip chart responses. An analyst will be able to move the strip chart response of one coil until it coincides with the second coil. If a consistent speed was maintained through the test, the resultant will be a single line. Present consideration for a rejection criteria is any time the two responses do not coincide. Additionally, the number of data points one strip chart response is translated will be used in the slewing process. Further information regarding rejection criteria for the bobbin profile overlays will be provided in our forthcoming response to question 3 from the May 16, 1996, RAI.

In the event of an unacceptable offset between the slewed bobbin profiles, the area of interest will be reexamined. If subsequent reexaminations still do not provide an aceeptable offset between the slewed bobbin profiles, the tube will be removed from service.

NRC Question 11 (May 8, 1996)

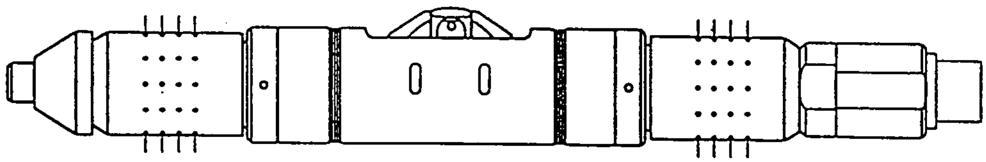
Discuss the need for and, if necessary, provide a description of the protocol for performing independent diameter measurements by separate analysts and for resolving discrepancies.

Response to Question 11

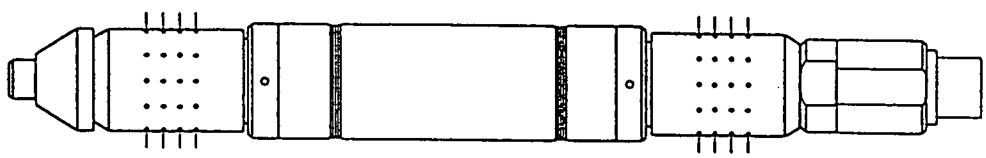
It has been the practice at KNPP sinee 1985 to have two independent teams complete the analysis of all plant eddy current data. The two teams continue to be from different inserviee inspection organizations in order to maintain independence. For the analysis of HEJ indications utilizing the +Point/2Bobbin combination probe, this practice will be maintained.

During the 1996 refueling outage KNPP will inspect all of the HEJ joints with a standard sleeve +Point probe, using independent analysis teams, for the detection of PTIs. The +Point/2Bobbin combination probe will be used as a supplemental examination to measure the diameter change between the maximum point of the sleeve hardroll and the diameter at the elevation of the PTI. Analysts from each inservice inspection organization will perform diameter measurements and the results will be compared. Any discrepancies between the primary and secondary analysts will be resolved by the Level III shift lead analysts from both the primary and secondary analysis teams.

The analysts performing diameter measurements will be qualified in accordance with the KNPP site specific performance demonstration program. Detailed procedures and testing governing the analysis of combination probe data will be prepared by KNPP and Zetec prior to field implementation to ensure the analysts are familiar with the process for measuring diameters.



D#3791-1-A Test Probe



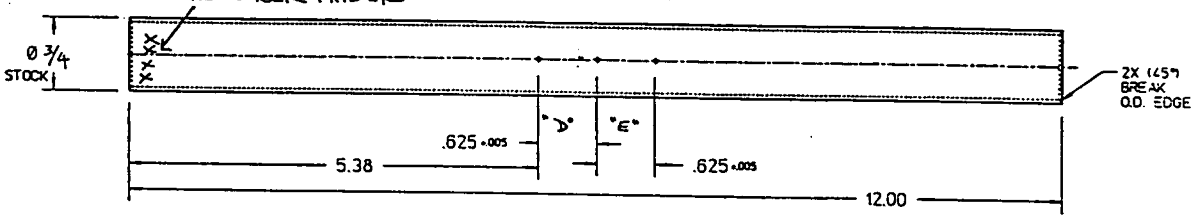
D#3792-1-A Reference Probe

Figure 1

					REVISIONS	REV. STATUS OF SHEETS	REVISIONS				
				.	REVISIONS		LTR	DATE	DESCRIPTION	APVD	CK	DR
				2	SHEET							

LOCATION	A	B	C
PHYSICALLY MEAS. DEPTH	THRU	THRU	THRU
DEPTH IN % OF WALL	100%	100%	100%
E.T. PHASE ANGLE MEAS.	NA		
DIA OF DEFECT ±.003	.052	.052	.052

SERIAL NUMBER THIS END



MATERIAL INCONEL 600
AVERAGE MEAS. WALL THK. .045
NOMINAL WALL THK. .043
HEAT LOT NO. 96834
TEST FREQ. USED NA
SERIAL NO. Z-14760
P.O. NO. NA
REL. NO. NA
QUALITY REL. NO. NA
DATE MFG. 3-26-96
Q.A. INSP. [signature]
CUSTOMER ZETEC IN-HOUSE
RECORDED NA
PROBE USED NA
REVIEWED BY [signature]

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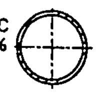

NOTE:
"D" spacing = .6262"
"E" spacing = .6261"

UNL. OTHERWISE SPECIFIED
DIM ARE IN INCHES
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DECIMAL FRACT. ± 1/16
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.XX ±.050
X ±.003
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TITLE HEJ SLEEVE PROBE SET-UP STANDARD.
D#3793-1-A P=3185

SIMILAR | DWG NO 2-400-1062
SCALE NTS | USED ON | SHT 1 OF 2

Figure 2

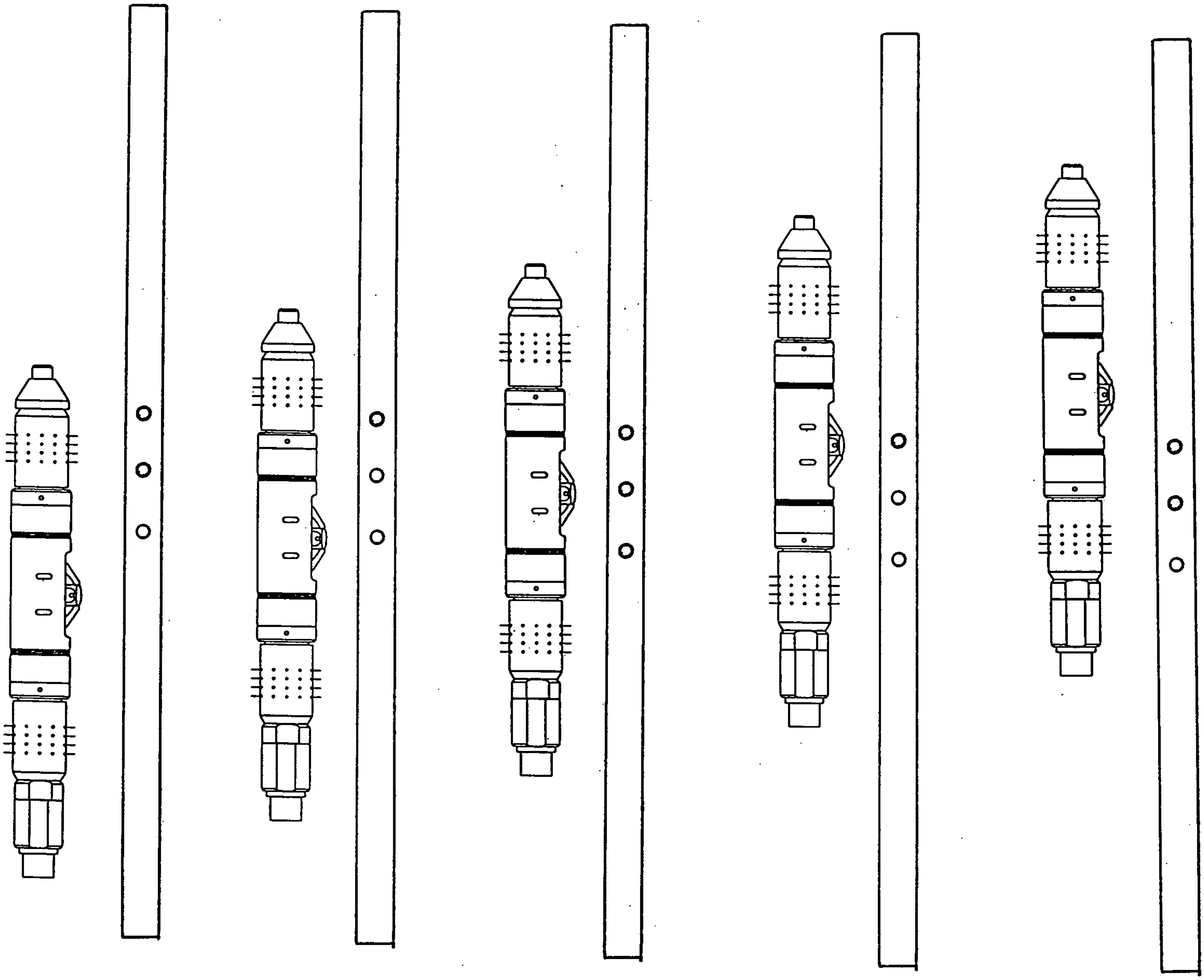


Figure 3

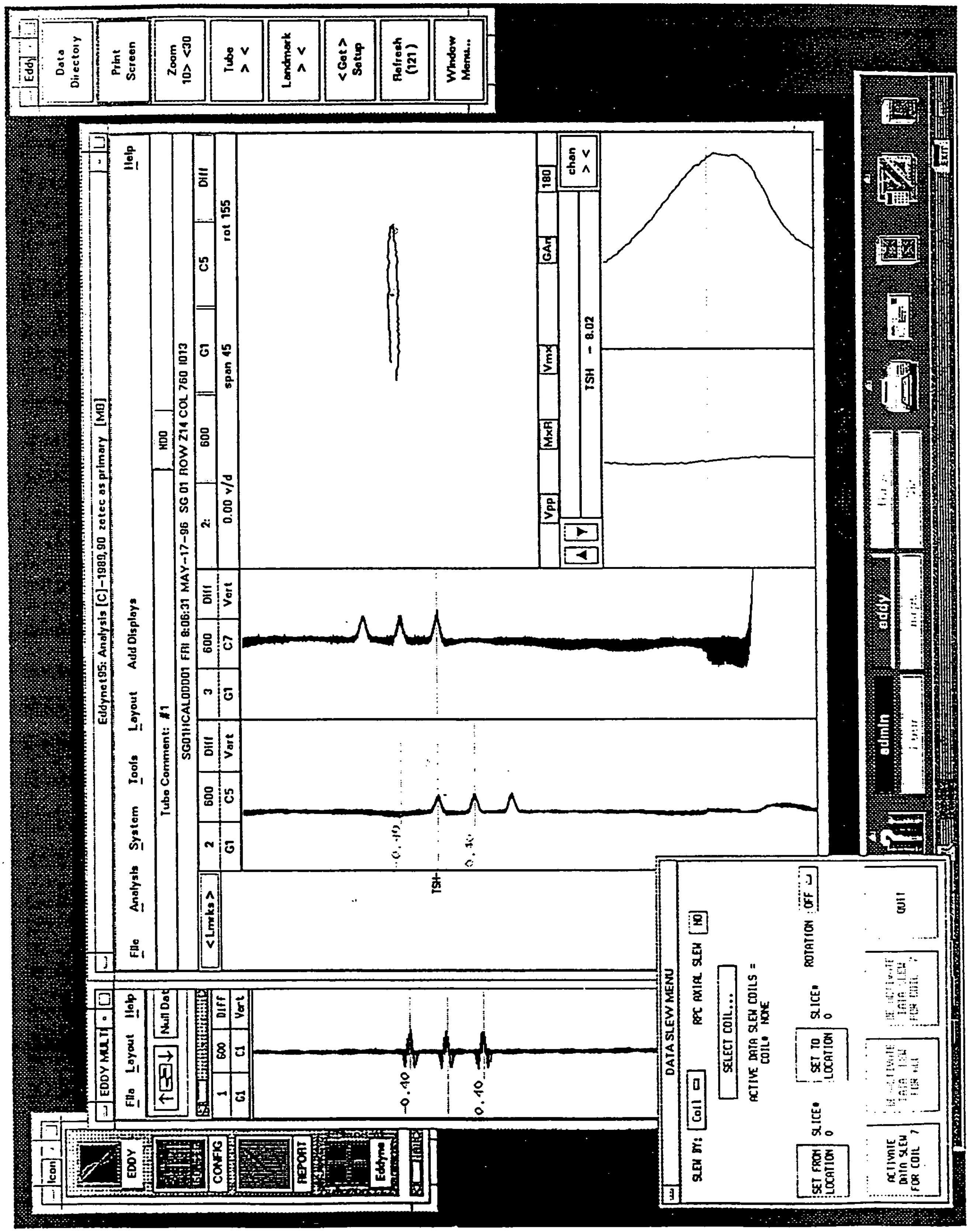

Data Directory
Print Screen
Refresh (121)
Window Menu...
Tube Comment: #1
Add Displays
DATA SLEW MENU
SELECT COIL...
QUIT
admin
eddy

Figure 4

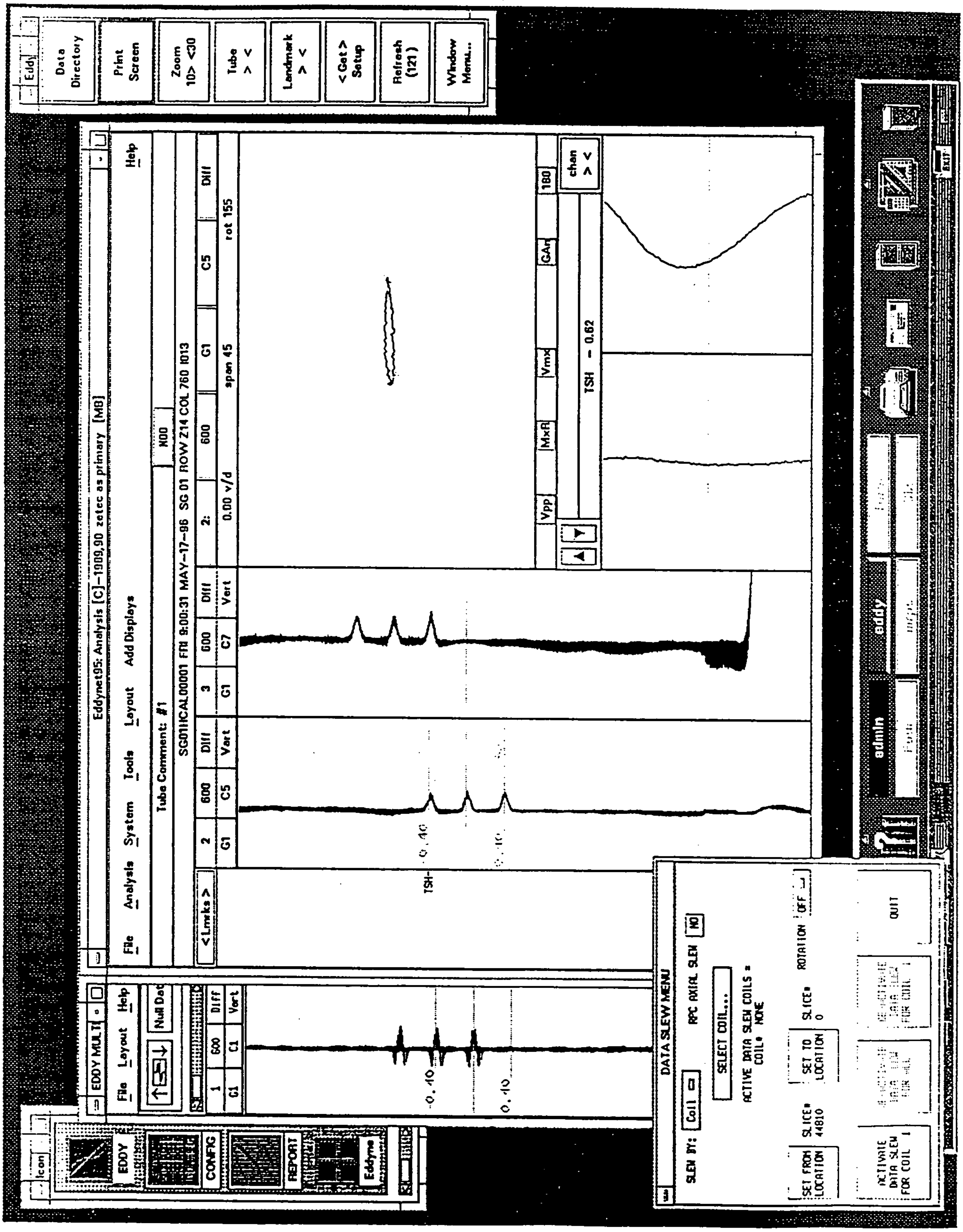
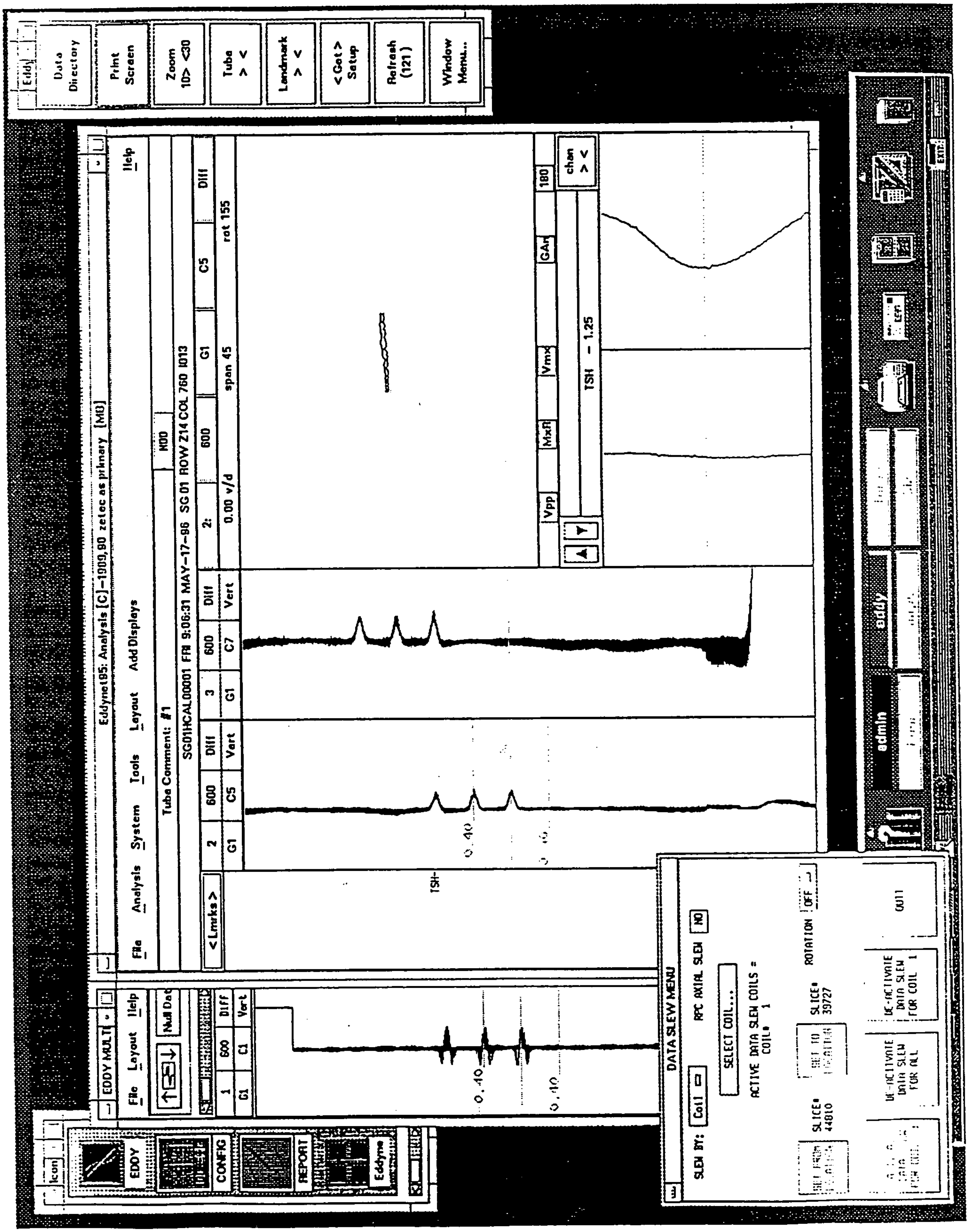
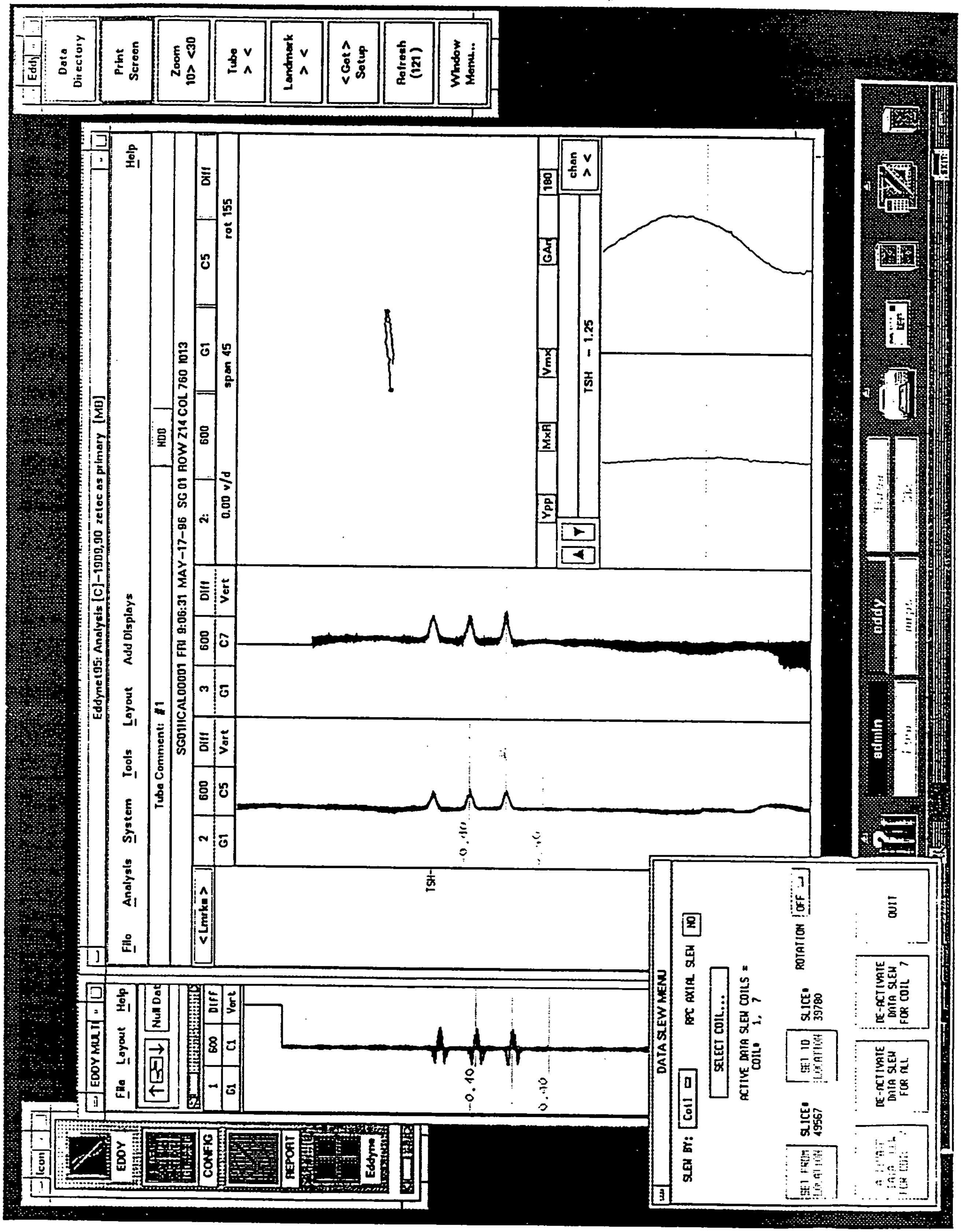

Data Directory
Print Screen
Zoom
Tube
Landmark
Refresh
Window Menu...
Tube Comment: #1
DATA SLEW MENU
SELECT COIL...
QUIT
CONFIG
REPORT
admin
eddy

Figure 5



Data Directory
Print Screen
Zoom
Tube
Landmark
Refresh (121)
Window Menu...
Eddynet95: Analysis [C]-1989,90 zetec as primary [MB]
File
Analysis
System
Tools
Layout
Add Displays
Help
Tube Comment: #1
SG01HCAL00001 FRI 9:06:31 MAY-17-96 SG 01 ROW 214 COL 760 I013
span 45
rot 155
TSH - 1.25
DATA SLEW MENU
SLEW BY:
RPC AXIAL SLEW
SELECT COIL...
ROTATION
QUIT
EDDY
CONFIG
REPORT
admin
eddy

Figure 6



Eddyne195: Analysis [C]-1999,90 zetec as primary [MB]
File
Analysis
System
Tools
Layout
Add Displays
Help
Tube Comment: #1
SG01ICAL00001 FRI 9:06:31 MAY-17-96 SG 01 ROW 214 COL 760 1013
span 45
rot 155
TSH - 1.25
Data Directory
Print Screen
Landmark
Refresh (121)
Window Menu...
DATA SLEW MENU
SLEW BY:
RPC AXIAL SLEW
SELECT COIL...
ACTIVE DATA SLEW COILS =
ROTATION
QUIT
CONFIG
REPORT
EDDY
admin

Figure 7

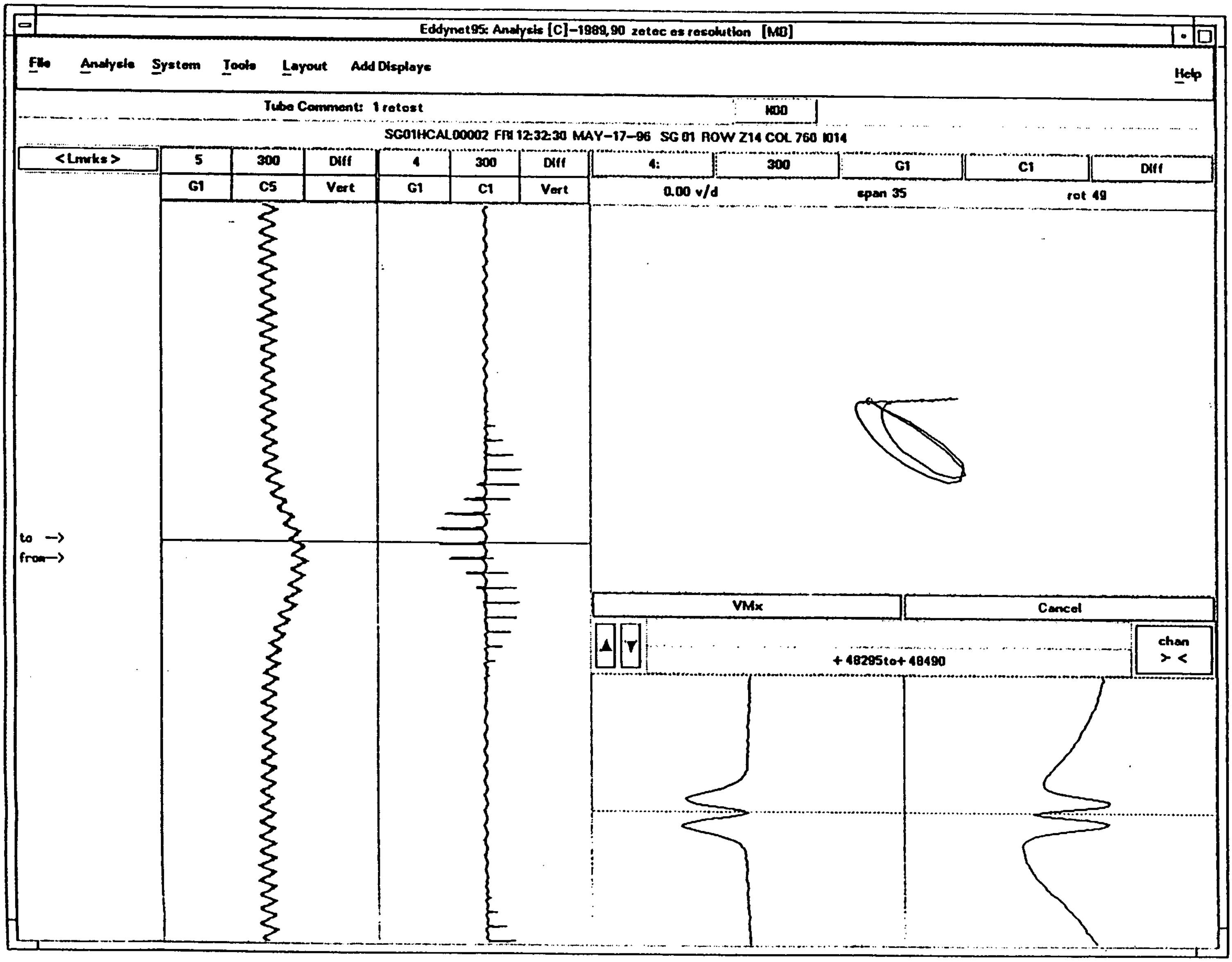

Eddynet95: Analysis [C]-1989,90 zetec as resolution [MB]
File
Analysis
System
Tools
Layout
Add Displays
Help
Tube Comment: 1 retest
NDD
SG01HCAL00002 FRI 12:32:30 MAY-17-96 SG 01 ROW Z14 COL 760 I014
<Lmrks>
5
300
Diff
G1
C5
Vert
4
300
Diff
G1
C1
Vert
4:
300
G1
C1
Diff
0.00 v/d
span 35
rot 49
to →
from→
VMx
Cancel
+48295to+48490
chan
> <

Figure 8