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# International Agreement Report

# RELAP5 Assessment Against PACTEL Experimental Data (Revision 1)

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**RELAP5 Assessment Against PACTEL Experimental Data**

**Abstract**

The results of the pre-test and post-test calculations of OECD International Standard Problem no.33 (ISP-33) are presented. The frozen version of RELAP5 code version MOD2 and the latest released version MOD3.2 have been assessed against experimental data from PACTEL facility. Generally, predictions were in good agreement with experimental data, except in the most interesting part of the transient only MOD3.2 was able to follow periodic hot leg loop seal clearance phenomena and primary pressure oscillations closely.

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## INTRODUCTION

In the 1990's the interest for eastern nuclear power plants safety has increased significantly. The VVER-440 heat removal capability in accidental situations has been studied mostly. VVER-440 nuclear power plants (NPPs) differ considerably from western type Pressurized Water Reactor (PWR) plants. The main distinguishing characteristics, beside horizontal steam generators, are loop seals not only in cold but also in hot legs. The horizontal steam generator (SG) design degrades natural circulation driving force. The top of SG tubes is only at about 1 m higher elevation than hot leg connection to the reactor vessel. Along with the hot leg loop seal such construction almost disables the reflux cooling process in the case of Small Break Loss-of-Coolant Accidents (SB LOCA).

Nuclear safety oriented OECD ISP-33, focused on VVER-440 core cooling capability, started in 1992. The experiment, performed on the PACTEL integral test facility, built in Lappeenranta, Finland, simulated different stages of a Small Break Loss-of-Coolant Accident (SB LOCA). Natural circulation is essential for decay heat removal in the accident situations of the light water reactors. The experiment with stepwise reduction of primary inventory was considered relevant for VVER-440 safety since it would demonstrate the ability of the plant to remove decay heat with different amounts of primary inventory, developing different patterns of natural circulation. Since VVER-440 and PACTEL facility are equipped with horizontal steam generators, which lowers the elevation between core and steam generator tubes, the study of natural circulation was strongly desired for this kind of nuclear power plant.

## PACTEL FACILITY DESCRIPTION

The PACTEL integral test facility [1, 2] in Finland (**Figure 1**) is a 1:305 scaled down 3-loop model of a 6-loop VVER-440 PWR NPP, ex-Soviet design, also built in Finland.

The facility consists of reactor vessel model, external downcomer, three loops with three SGs and a pressurizer connected to hot leg no. 1. Reactor core is modelled by 144 electrically heated rods, in three separated parallel triangularly shaped BWR-like channels. All the elevations in the facility are preserved as on the original plant. The same is valid for active core height, since heater rod length is 2.5 m. Axial power distribution is uniform. Maximum core power is only 1 MW which is about 20% of the scaled nominal power (1475 MW / 305 = 4.84 MW). There were no primary coolant pumps built in the facility, thus only natural circulation driven experiments were possible to be conducted on the facility at the time of the test. The Emergency Core Cooling Systems (ECCS) are also installed on the facility, but neither, high pressure, low pressure system nor passive hydroaccumulators were in action during the ISP-33 experiment. Each steam generator contains 38 horizontal heat exchange U-tubes with the average length of 8.8 m. The secondary water level control is performed by means of manual feedwater control.

There is an instrumentation system, consisting of a data acquisition unit, a controller and a workstation, dedicated to the PACTEL facility.

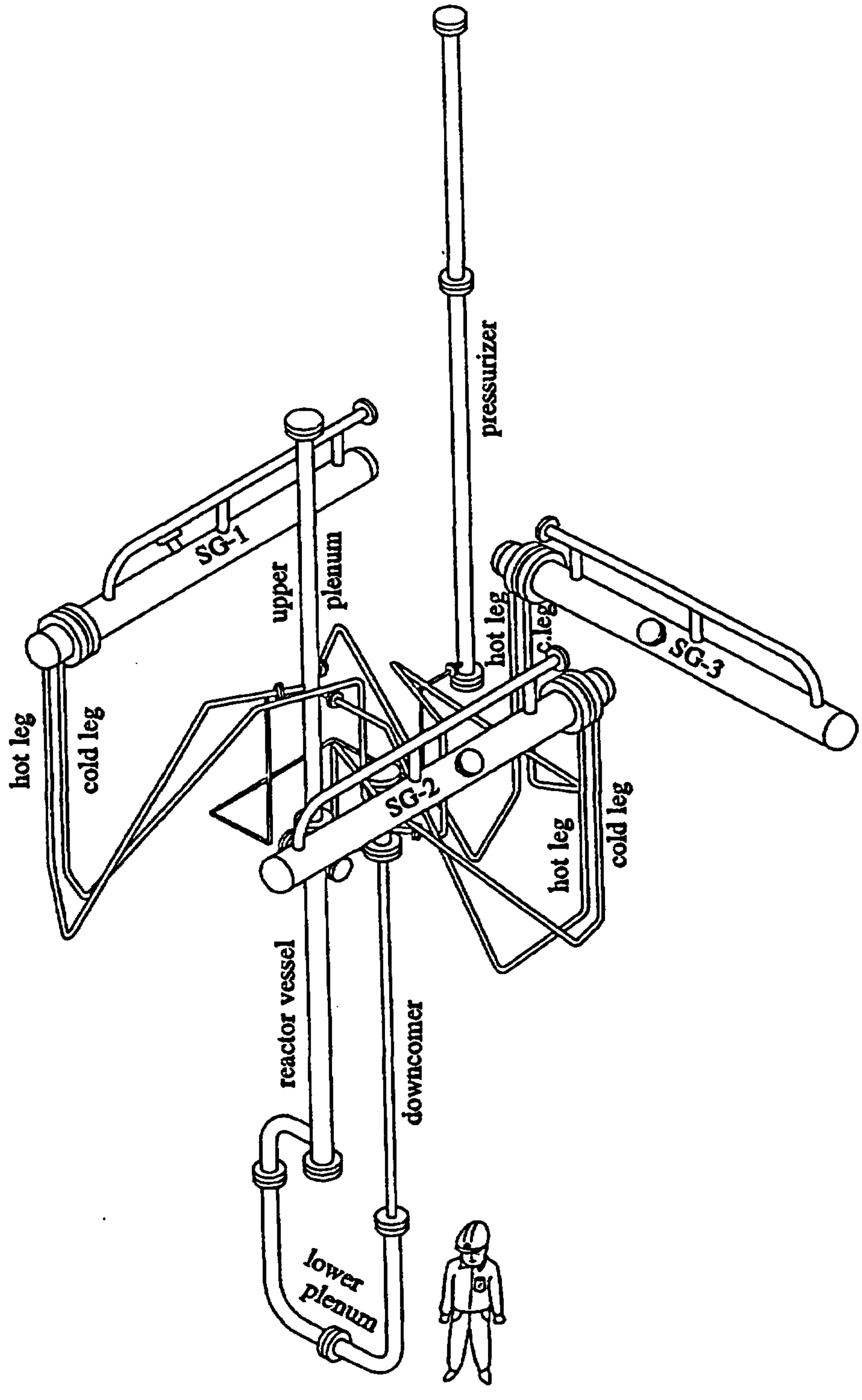


**Figure 1:** Axonometric view of the PACTEL facility

## PACTEL COMPUTER MODEL DEVELOPMENT

The ISP-33 experiment was announced as a blind exercise. However, since it was supposed that there was not enough experience in modelling VVER-440 plants or their scaled-down models at that time, the data for a special, so called "characterizing test" were distributed among the participants in the pretest period. The characterizing test included some elements of the later ISP-33, so that the participants could tune the response of their models to a part of the SB LOCA sequence. The "characterizing test" has been performed on PACTEL facility prior to ISP-33 experiment.

A full 3-loop model has been developed at IJS [3] and is shown in **Figure 2**. It consists of 221 hydrodynamic volumes, 238 junctions and 259 heat structures with 1263 mesh points. Three parallel core channels were modelled lumped together as one channel. First MOD2 model [4] has been developed and initialized into another steady state condition, corresponding to the "characterizing test" data. The MOD3.2 deck was simply copied from the previously developed MOD3.0 deck, originating from MOD2 and upgraded only as much as requested in the Manual [5].

Finally, both models have been driven to 155 kW core power and initialized to the actual ISP-33 steady state conditions.

### Characterizing Test Description

The characterizing test started from steady-state natural circulation at 180 kW core power. For demonstrating the system response with two pressurizer heater power levels and system behaviour with a small letdown is demonstrated with the following events:

- (A) The pressurizer heaters power has been controlled manually. It was set to 4 kW at the beginning of the test, switched to 2 kW after 1260 seconds and increased back to 4 kW at 2290 seconds.
- (B) After 2640 seconds 13.5 kg of water has been drained from the lower plenum.

In this way some of the details in the model could be tuned, especially pressurizer response to perturbations, which showed later to be of essential importance for the correct ISP-33 test simulation.

### Results of the characterizing test simulation

The RELAP5 simulation started from the conditions at 1260 seconds of the transient, when the heater power was decreased to 2 kW, and followed the later sequence of events. The pressurizer pressure response (**Figure 3**) is shown to be adequate in both calculations. The slope of both curves from RELAP5 calculations is the same as in the experiment, which indicates that the primary system inventory distribution and thermodynamic state has been modelled adequately, as well as heat losses from different parts of the primary system. Another proof for correct modelling of the primary inventory is the pressurizer level development after the draining at 2640 seconds (**Figure 4**).

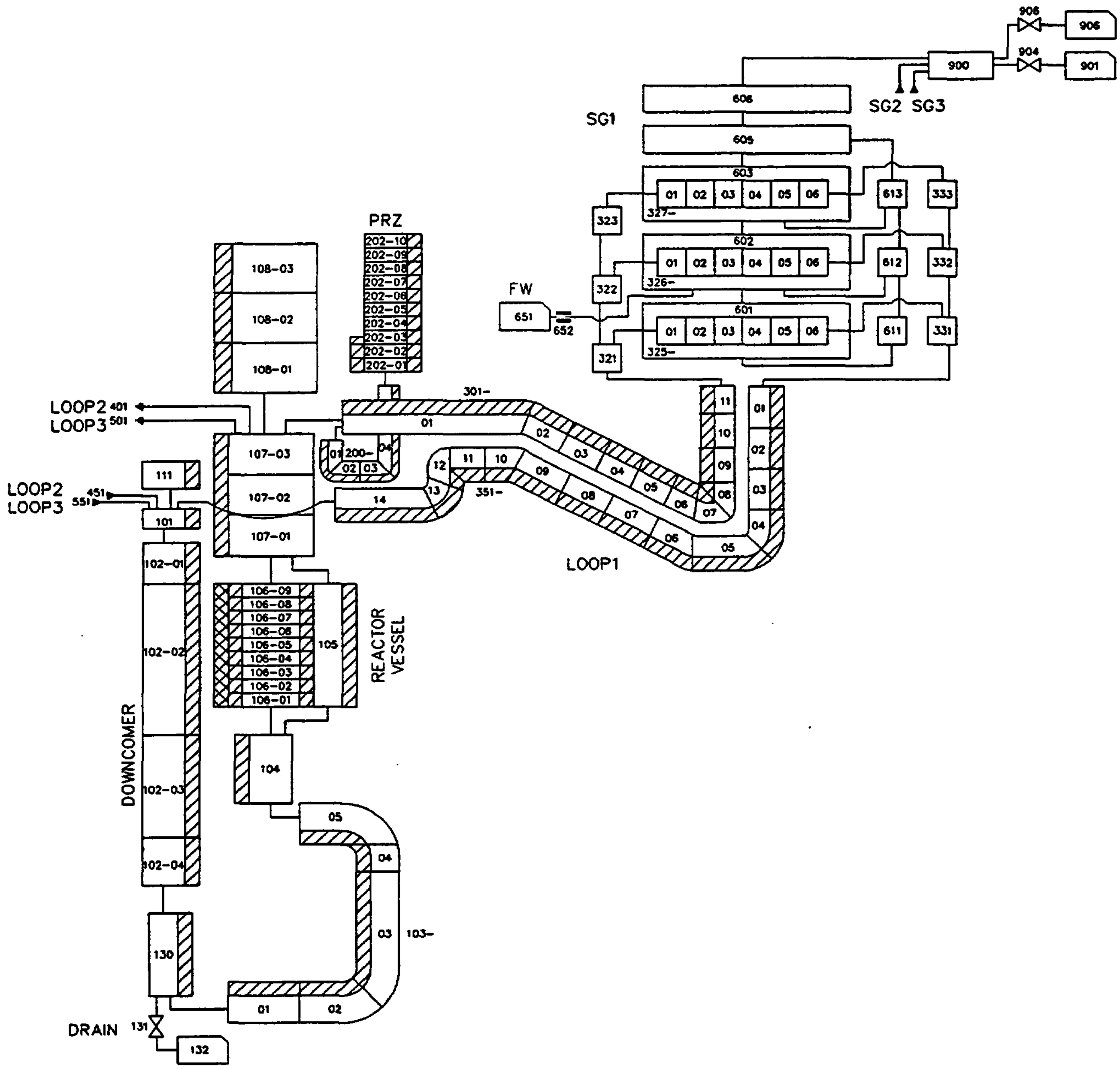


**Figure 2: PACTEL nodalization scheme for RELAP5 calculations of ISP-33**

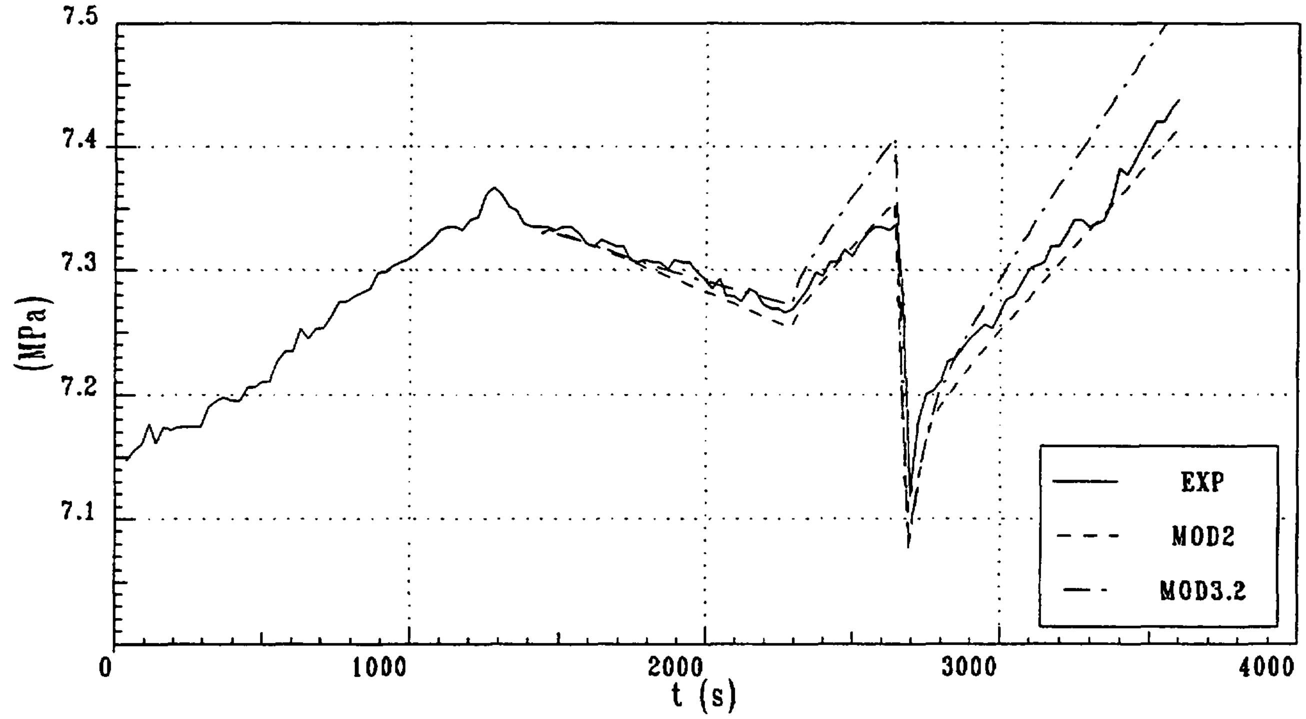


**Figure 3:** Characterizing test: pressurizer pressure

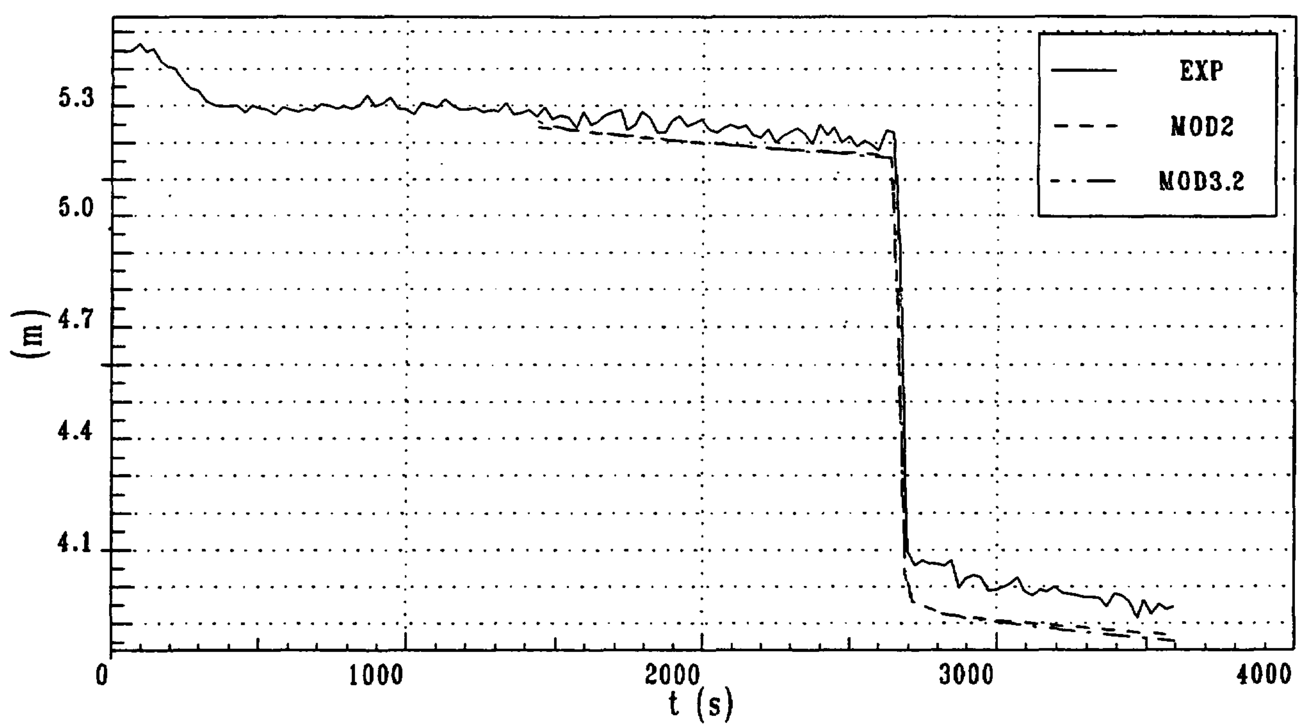


**Figure 4:** Characterizing test: pressurizer level

## EXPERIMENT DESCRIPTION

A special SB LOCA scenario with stepwise reduction of the primary inventory has been applied for simulation on the PACTEL facility. Initial conditions, listed in **Table 1**, have been matched closely in MOD2 and MOD3.2 model initialization and stabilization processes.

After the initial 1200 s steady state, 1st draining from the primary system has been performed. At that time 60 kg (about 9%) of the primary liquid has been drained from the lower plenum in 180 s. During that period only the pressurizer was emptied, while reactor vessel upper head and SG tubes remained filled with subcooled liquid. In the next 720 s period, the system was allowed to reach the new steady state condition.

During each next draining another 60 kg of the primary inventory have been drained in period of 60 s, following by 840 s undisturbed time intervals for the system parameters to reach new quasi steady state.

| PRIMARY SYSTEM | | SECONDARY SYSTEM | | |
|---|---|---|---|---|
| Core power | 165 kW | SG pressure | | 4.18 MPa |
| Pressurizer pressure | 7.39 MPa | SG levels: | SG 1 | 0.271 m |
| Pressurizer level | 5.18 m | | SG 2 | 0.272 m |
| Pressurizer heater power | 2 kW | | SG 3 | 0.263 m |
| Downcomer flow | 1.47 kg/s | SG feedwater temperature | | 305 K |
| Loop flow | 0.49 kg/s | | | |

**Table 1**: Initial Conditions for the ISP-33 Experiment

The most interesting phenomena took place between 2nd and 3rd draining, when single phase natural circulation was interrupted due to primary coolant depletion and steam bubble entrainment into hot legs. Oscillations of the pressurizer liquid level have been observed because of the increasing primary pressure, causing several hot leg no. 1 loop seal clearings and periodic liquid push-ups into the pressurizer.

Many other interesting phenomena were observed in the later time intervals between draining. As the primary system was emptying, single phase natural circulation switched to two-phase after the period of periodic flow blockage of single phase natural circulation. First hot legs emptied after hot leg loop seal clearance, and later the same process was observed in cold legs. Towards the end of the transient, the primary system emptied to such extent, that two-phase natural circulation was interrupted and almost all the remaining primary liquid was collected in lower part of the reactor vessel. At that time reactor core was hardly covered enough that stalled circulation could remove the heat from the core. After the last draining core uncovered and upper part of the rods overheated. When the peak clad temperature reached 623 K (350°C) core power was switched off in the experiment and the test was ended, but the calculations were supposed to continue till the peak clad temperature of 1173 K (800°C) would be reached.

A variation case experiment was performed on the facility, when, after core heatup, operator fully opened secondary relief valves to condense the vapor in the primary system and collapse it into the reactor vessel. This caused rapid core quenching. Only after a while, when the heater rods overheated again, core power was switched off and the variation case was ended. The variation case data and the corresponding RELAP5 calculated results are not presented here.

## IMPORTANT PHYSICAL PHENOMENA AS PREDICTED BY RELAP5

0) before the first draining (0 - 1200 s)

The obtained steady state in the first 100 seconds of the transient was stable in MOD2 calculation. Primary pressure was controlled by pressurizer heaters cycling, keeping it within the limits of 7.36 and 7.5 MPa. Secondary levels were controlled by automatic feedwater control and deviated insignificantly from the desired level setpoint of 0.27 m in each steam generator. Secondary pressure was controlled by appropriate opening of the valve, located on the steam line, after the joining point of three steam generator lines. All the other observed parameters behaved in a stable manner.

1) between 1$^{st}$ and 2$^{nd}$ draining (1200 - 2100 s)

The pressurizer was drained first. At the end of the first draining in MOD2 calculation the pressurizer was almost completely drained. The pressurizer surge line still remained filled with subcooled liquid. In both calculations the pressurizer level stayed slightly below 0.5 m till the next draining.

On the other hand the very top of the upper plenum emptied and a small vapor bubble was detected. Primary pressure dropped close to the saturating pressure, slightly below 6 MPa. Nevertheless, single-phase natural circulation proceeded with minor disturbances throughout this time interval in both calculations. MOD2 calculated mass flow interruption in cold leg no. 1 very early after the first draining.

2) between 2$^{nd}$ and 3$^{rd}$ draining (2100 - 300 s)

The reactor vessel upper plenum drained completely, while a larger amount of water was pushed back into the pressurizer, more drastically in MOD3.2 calculation. In both calculations half or more of the initial pressurizer inventory was restored. This remained till the third draining. A pressure rise was obtained in the primary system. A large pressure spike was calculated by MOD3.2, back up to the initial pressure level.

Hot leg loop seal emptying started in all the three loops. First hot leg loop seal levels decreased on the reactor vessel side, while vertical parts on the steam generator side remained almost filled up with some disturbances. MOD3.2 calculated larger hot leg loop seal emptying in all three loops on the reactor side of hot leg loop seals. Vessel inventory dropped quickly and first voiding occurred in the core region.

Heat transfer to the secondary system was interrupted during this time interval in steam generators 1 and 3 in MOD2 calculation, while MOD3.2 calculated interruption in steam generators 2 and 3. The flow through cold leg no. 2 was interrupted in both calculations. Two-phase natural circulation took place through loop 2 in MOD2 and through loop 1 in MOD3.2 calculation.

3) between 3$^{rd}$ and 4$^{th}$ draining (3000 - 3900 s)

Pressurizer was again drained completely. Primary pressure dropped below 5 MPa. More voiding took place in the core. The whole part of the reactor vessel above the core was emptied and hot leg loop seals were further emptying. The loop 2 hot leg loop seal emptied deeply on the reactor side in MOD2 calculation. Some voiding was briefly detected in cold leg 1 in MOD3.2 calculation. Exactly the reverse happened on the steam generator side of the hot leg loop seals in loop 1 and 2.

Some water was pushed through the steam generator 1 tubes from hot to cold side in MOD3.2 calculation, while MOD2 calculated the liquid transfer through the SG no. 2. Two-phase natural circulation proceeded through the same loops as in previous time interval. Vessel inventory remained almost constant in this time interval and primary level stayed well above the active part of the core.

4) between 4$^{th}$ and 5$^{th}$ draining (3900 - 4800 s)

Primary pressure dropped close to the secondary pressure. A slight level rise was detected in the pressurizer, more obvious in MOD2 calculation. Heat transfer was interrupted in SG no. 2 in both calculations and restored or proceeded through the rest two steam generators. A larger amount of liquid was pushed through the SG no. 2 and 3 tubes. Hot leg loop seals no. 2 and 3 were cleared shortly after the 4$^{th}$ draining. Larger voiding was detected in loop 1 and 3 cold legs, but later the inventory was restored.

Steam generator tubes emptying started in loops 1 and 3. Vessel inventory slowly decreased, but the primary level still remained above the core. Two-phase natural circulation proceeded and was switched through loops 1 and 3 in both calculation.

5) between 5$^{th}$ and 6$^{th}$ draining (4800 - 5700 s)

Water continued to be pushed back into the pressurizer, but no primary pressure rise was calculated. Two-phase natural circulation was severely disturbed in all the three loops. Steam generator tubes were more than half emptied and cold legs emptying started, but the core still remained sufficiently covered, where MOD2 calculated larger level drop. All the three hot legs were already completely emptied by this time. Heat was transferred equally through all steam generators.

6) between 6th and 7th draining (5700 - 600 s)

Steam generator tubes were drastically emptied. The level dropped in all cold legs. Two-phase natural circulation was definitely interrupted in the whole system. Stalled recirculation within reactor vessel became the mechanism of core heat removal. Still more water was pushed into the pressurizer, where close to the half inventory was again restored. Larger core uncovering was calculated especially by MOD2. First slight voiding in the reactor vessel downcomer was calculated by MOD3.2. Heat transfer proceeded through all the three steam generators.

7) between 7th and 8th draining (6600 - 7500 s)

After this draining only cold leg loop seals remained filled with smaller amount of liquid and reactor vessel downcomer started voiding. The top half of the core was already filled with voids, but the heat removal remained sufficient to prevent core heatup. Larger amount of water was still kept in the pressurizer vessel. Sufficient heat transfer still proceeded through all three steam generators.

8) between the 8th draining (7500 s - core overheat to 350°C

Core level dropped quickly and a sudden core overheat started already at the beginning of the last draining process. Level dropped in reactor vessel downcomer, mainly drained through the break and some pushed below the core. Pressurizer draining started, but that was not sufficient to cover the core sufficiently.

Heat transfer was suddenly interrupted through all three steam generators. The whole primary system, except bottom part of the reactor vessel, was empty by that time. The experiment has been prolonged after the initial core heatup, when operator applied ultimate procedure and opened SG secondary PORV. The vapor condensed in the whole primary system and collapsed into the core. Pressurizer was instantaneously drained. Heat transfer through the steam generators was restored and core heatup was stopped. However, the calculations were stopped when maximum cladding temperature reached 350°C (623 K).

RESULTS

There have been no changes introduced in any of the code versions. No deviations from the user guidelines have been introduced in the input decks. No sensitivity cases are presented in the report. The ISP-33 transient has been modelled up to the time when core heatup occurred in the defined base case and no simulation of the prolonged base case or the variation case is shown here.

Basically, the model has been unchanged also for post-test calculations. Only a few changes have been made in the facility model in the post-test period, mainly because of some deficient or unclear initial condition data provided by the ISP-33 organizers. For the pretest calculation the core power was set 155 kW, but in the post-test period some uncertainty in core power measurement has been reported, so 165 kW was used for post-test calculation. The uncertainty of the measurement data were given by the organizers as follows:

| | | |
|---|---|---|
| - temperatures | ± 1 | K |
| - differential pressures | 0.5 - 1 | % |
| - absolute pressures | 0.15 - 0.3 | % |
| - flows | 1 - 1.5 | % |
| - levels | 1.5 - 2.5 | % |
| - core power | 1 | % |

Beside the mentioned change in the input model, a small recirculation flow path has been modelled from upper plenum to upper head. This change has been introduced to achieve and stabilize initial upper head liquid temperature and match it to the experimental data. A servo valve has been modelled in the recirculation flow path governed by the difference of the actual and desired upper head temperature. In the transient the servo valve opening was fixed to the value which was stabilized in the steady-state. This procedure ensures achievement of the prescribed upper head liquid temperature, which is one of the essential parameters influencing the order of primary system emptying and bubble formation in the initial test period up to the second draining.

The procedure for the calculation was the same for MOD2 or MOD3.2. First the base input deck, given in Appendix A was run in steady-state mode. When the model has stabilized satisfactorily, the data from the output have been transferred to the base case input deck. Run mode has been switched to transient and recalculated for one time step, only to produce restart no.0. For the experiment simulation, run input deck, given in Appendix B, has been run from restart no.0. Few components for artificial pressure and level control have been deleted or controllers fixed to the final values achieved in the steady-state run. Trip logic for the experiment simulation has been added, as well as the drain valve and a part of the steam line. The transient has been then run till the stop trip has become true when the maximum cladding temperature has reached the prescribed value of 623 K.

For the completeness of the shown results the complete set of comparison plots, as requested by the ISP-33 organizers is given in Appendix C, together with the corresponding strip input deck.

First the results of the RELAP5/MOD3.2 calculations are shown. Pre-test and post-test results are compared to the experimental data. After the 1st draining, primary pressure (**Figure 5**) dropped to the saturation value. Only the pressurizer has almost emptied (**Figure 6**), while the rest of the primary system remained filled with liquid. Single-phase natural circulation proceeded. When after the 2nd draining bubble was formed in all hot legs, single-phase natural circulation was interrupted. While the heat generated in the core could not be transported to the steam generators, primary pressure rise was observed. This pushed liquid back to the pressurizer and cleared the hot leg no. 1 loop seal (the one with the pressurizer). Several hot leg no. 1 loop seal clearings have been observed during this period [6]. Each time when the pressure peak was reached, liquid was partly drained back from the pressurizer and flooded the hot leg no. 1 loop seal. After the next draining liquid was finally drained from the pressurizer and hot leg loop seals, so the two-phase natural circulation took over the heat removal from the core. When the primary system was further emptied, liquid remained only in the reactor vessel, boiling as in a pool. Steam was carried to the steam generators, condensed there an drained back to the reactor vessel. Stalled natural circulation in the reactor vessel was shown to be sufficient to remove the heat from the core, while the core was still covered. After the 7th draining the core uncovered and heated up quickly. It can be observed that MOD3.2 calculated core heat-up one time interval too late, which means, that it was not able to predict liquid hold-up in the primary piping.

The most interesting part of the transient, between the 2nd and 3rd draining has been simulated very well by MOD3.2, already in the pretest calculation. The increased core power in the post-test calculation brought some slight improvement of the calculated parameters, but the influence of the introduced upper head recirculation can be more clearly seen. Since the upper head temperature decrease was slower, flashing occurred earlier in the upper head. This prevented total emptying of the pressurizer, which is an adverse influence, but it improved the primary pressure behaviour.

More problems were encountered in the MOD2 simulation, although it has to be mentioned, that it predicted the initial 1200 seconds of the steady state better than MOD3.2. The pressurizer heaters were supposed to maintain the primary pressure between 7.36 and 7.5 MPa automatically by switching between 2 and 6 kW power. It can be observed in **Figure 7**, that the primary pressure response to the pressurizer heaters cycling was correct. Some early flashing occurred in the upper head already after the 1st draining, which prevented total emptying of the pressurizer (**Figure 8**). The rising primary pressure pushed some liquid back to the pressurizer, but couldn't clear any of the hot leg loop seals, not even in the post-test calculation [6].

No significant differences were observed between pre-test and post-test calculations for both code versions. Some more differences between MOD2 and MOD3.2 can be seen on the following figures.

Some early flashing in the reactor vessel upper head and consequently reactor vessel inventory depletion can be observed on **Figure 9** already between 1st and 2nd draining in MOD2 calculation. This prevent pressurizer to empty completely and less bubble was formed in hot legs. Single phase natural circulation has only been interrupted for a shorter time. Consequently the primary pressure rise was not sufficient to clear any of the hot leg loop seals and push as much liquid back into the pressurizer as it happened in the experiment. The bubble has not been formed in the upper head before the second draining in MOD3.2 calculation, so the phenomena of single phase natural circulation interruption have been described correctly. After 6[th] draining it can be observed, that reactor vessel liquid inventory predicted by MOD3.2 was slightly lower than in MOD2 calculation, but it did not affect the further results. The calculation ended already after 7[th] draining, as in the experiment.

Both calculations show that core level has been kept too high in both calculations after the 6[th] draining. This is the indication that the liquid, which has accumulated in SG tubes in the experiment, has been drained back into the reactor vessel in RELAP5 calculations, which prevented core heat-up already after the 7[th] draining (**Figure 10**).

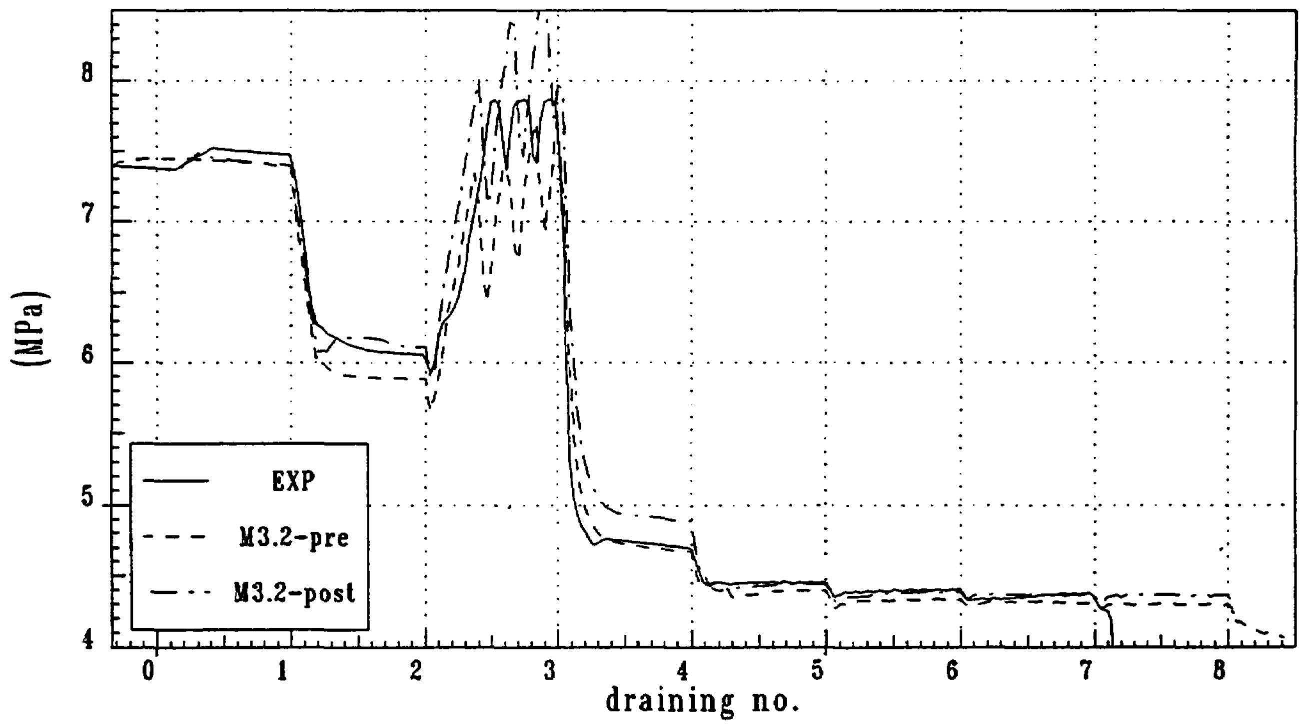


**Figure 5**: RELAP5/MOD3.2 - upper plenum pressure

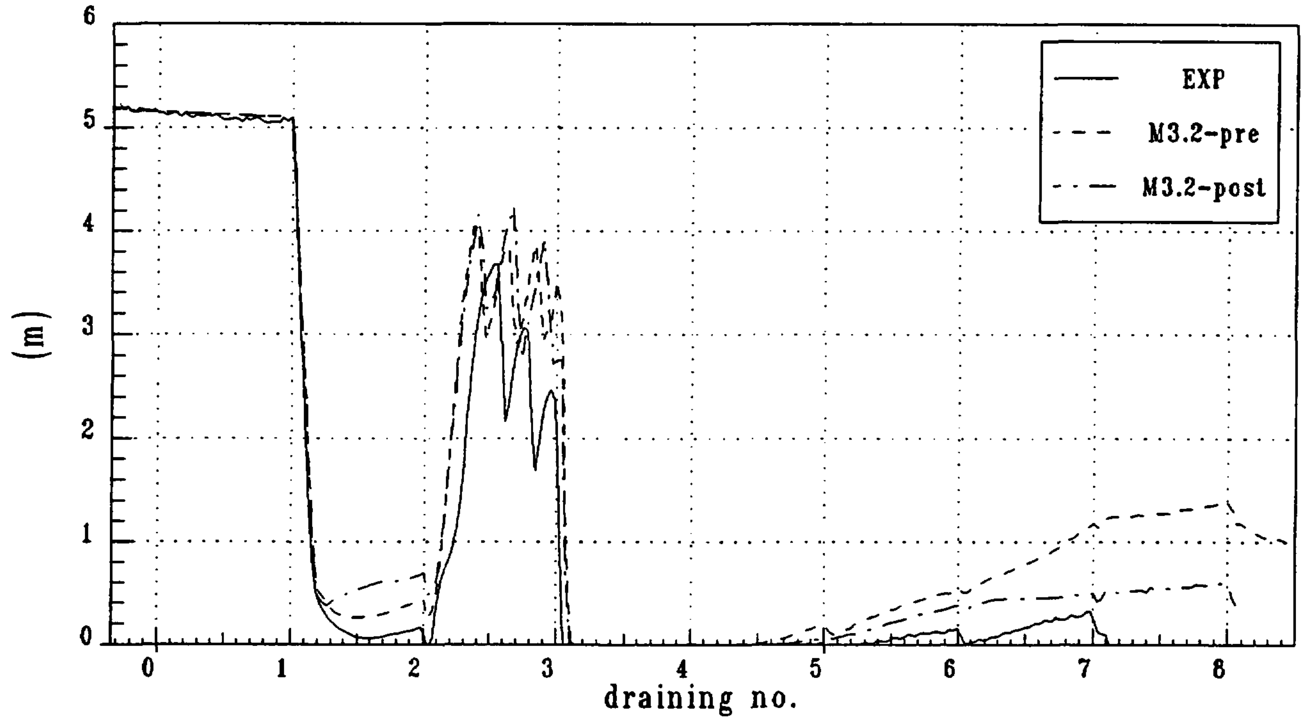


**Figure 6**: RELAP5/MOD3.2 - pressurizer level

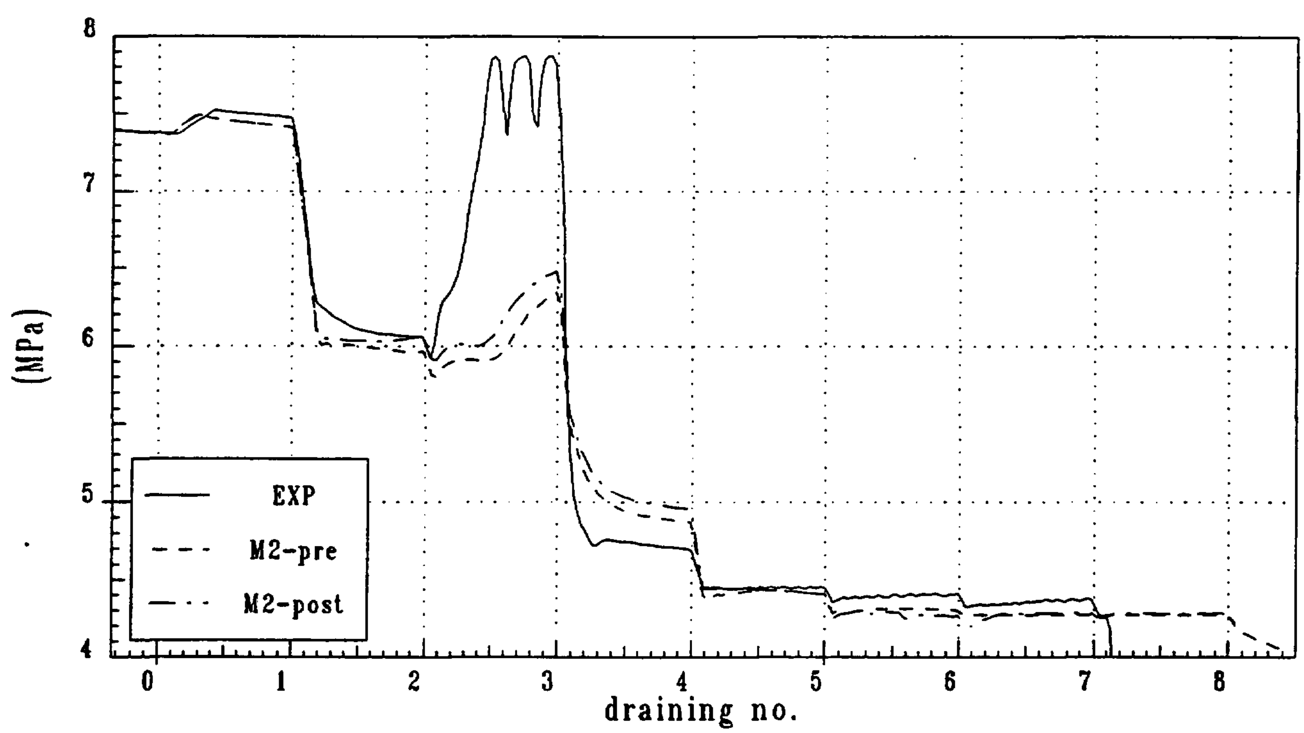


**Figure 7**: RELAP5/MOD2 - upper plenum pressure

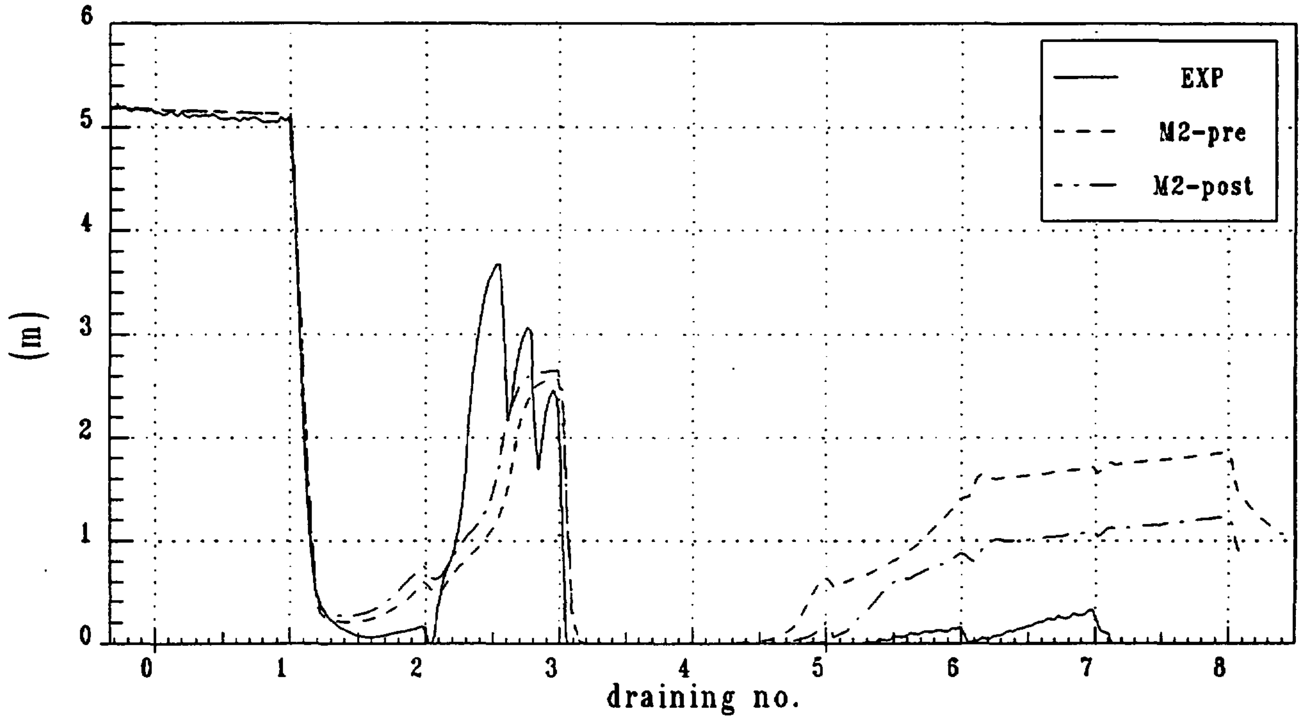


**Figure 8: RELAP5/MOD2 - pressurizer level**

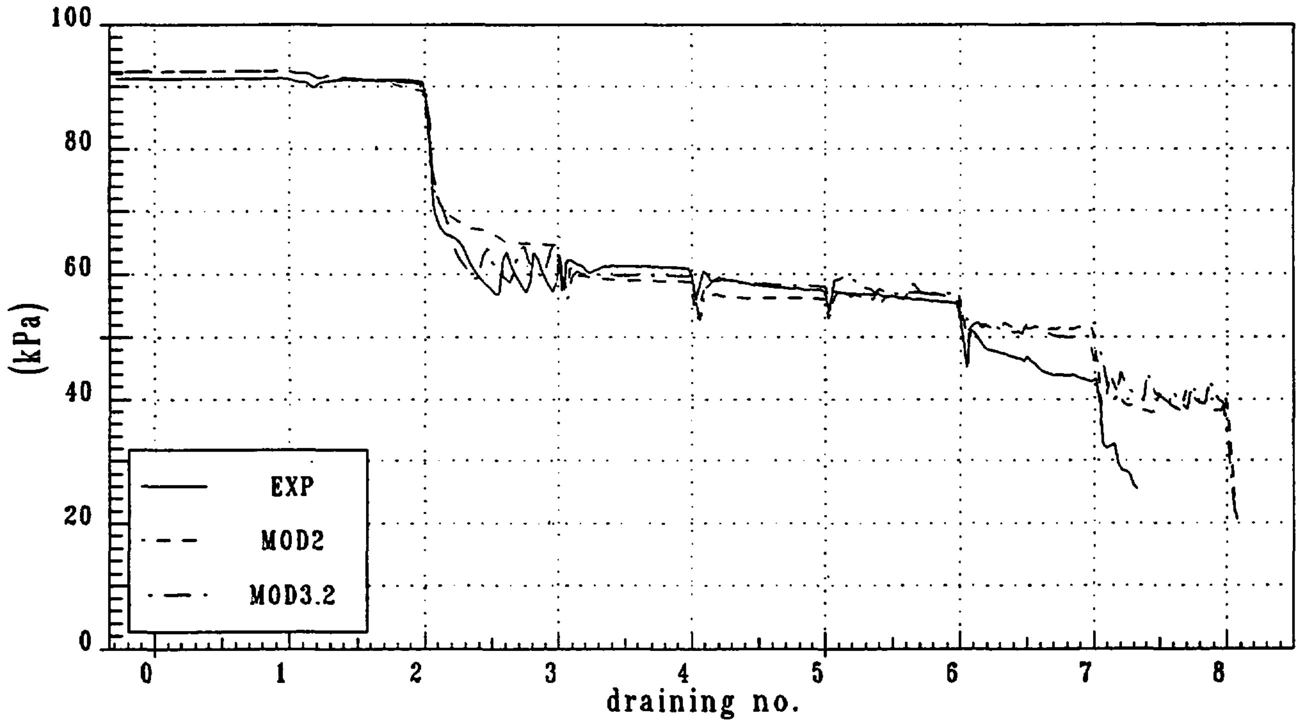


**Figure 9: Comparison of RELAP5 predictions - DP over the reactor vessel**

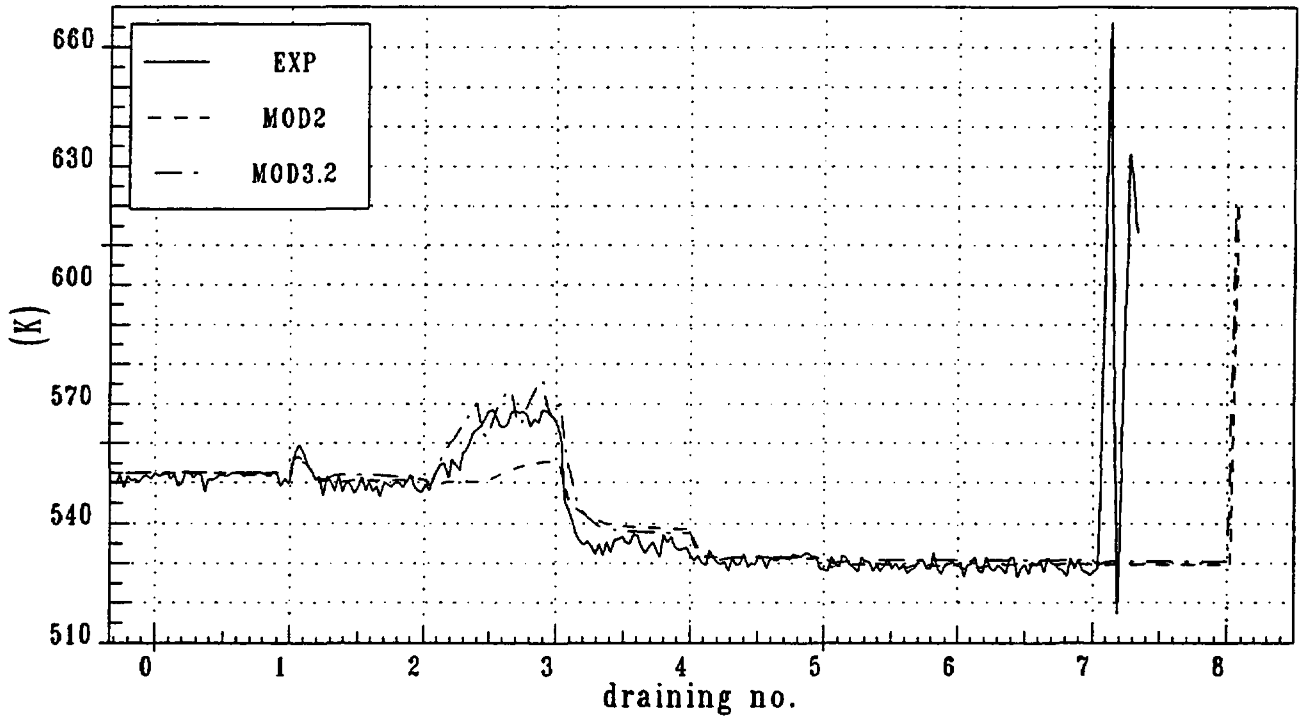


**Figure 10:** Comparison of RELAP5 predictions - maximum cladding temperatures

## COMPUTER DATA AND RUN-TIME STATISTICS

MOD3.2 calculations have been performed on DEC Alpha with OpenVMS AXP Version V1.5 operating system, while the calculation with RELAP5/MOD2 has been performed on SUN Sparc 20 computer under SOLARIS 2.5 operating system. On average SUN computer is almost 4 times slower for RELAP5 calculations than DEC Alpha. RELAP5/MOD2 has not been installed on DEC Alpha computer, since there have been certain difficulties with the Fortran optimization option, so benchmarking was not successful.

Run-times for the pre-test and post-test calculations have been almost identical for both machines, since input models have been only slightly changed. Thus only run-time statistics for post-test calculations have been listed in **Table 2**. Time step has been kept constant at maximum value of 0.1 seconds for all the calculations and number of repeated time steps was less than 10.

| Calculation | Computer time CPU (sec) | Total number of time steps (NT) | Number of volumes (N) | Grind time CPU/(N*DT) |
|---|---|---|---|---|
| RELAP5/MOD2 | 35308 | 75665 | 221 | 2.11E-3 |
| RELAP5/MOD3.2 | 8957.5 | 75522 | 221 | 5.37E-4 |

**Table 2:** Run-time statistics for post-test calculations

## CONCLUSIONS

The ISP-33 experiment gives a very good basis for RELAP5 code assessment. The way it was performed, provides several sets of independent data, since each time interval between draining describes different SB LOCA phase.

Both RELAP5 code versions followed most of the transient reasonably well, with the exception that all predicted core over-heat one time interval too late. This was due to inability of both codes to hold as much water inside SG tubes, as the experiment showed. A post-test calculation with MOD2 proved, that only slight incitation of SG tubes enables RELAP5 to predict liquid hold-up in SG tubes and improves the results significantly. For MOD3.2 this was not sufficient, so water stayed more in the reactor vessel and core heatup occurred one draining later.

Some differences between the two code version results were observed in the most interesting part of the transient, after the second draining. While MOD3.2 predicted hot leg loop seal clearance and liquid push-up into the pressurizer, caused by primary pressure oscillations very well, MOD2 could not clear any of them at all. These differences can partly course in different heat transfer packages coded in the two versions. Better phase separation prediction, different interface heat transfer coefficients calculated, more vapor generation and sharper primary pressure rise in MOD3.2 calculations may origin in different heat transfer correlations and more sophisticated flow regime maps in MOD3.2 than in MOD2.

## REFERENCES

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[3] I.Parzer, S.Petelin, O.Gortnar, B.Mavko, M.Željko: ISP-33 PACTEL Pretest Calculation, IJS-DP-6528, Ljubljana, November 1992.

[4] W.H.Ransom, R.J.Wagner, J.A.Trapp, L.R.Feinauer, G.W.Johnsen, D.M.Kiser, R.A.Riemke: RELAP5/MOD2 Code Manual, NUREG/CR-4321, EGG-2396, Idaho Falls, Idaho, USA, August 1985.

[5] RELAP5/MOD3 Code Manual, NUREG/CR-5535, INEL-95/0174 (Formerly EGG-2596), Idaho Falls, Idaho, USA, June 1995.

[6] I.Parzer, S.Petelin, O.Gortnar: Hot Leg Loop Seal Clearance Prediction in ISP-33, ASME 1993 Winter Annual Meeting, New Orleans, November 28 -December 3, 1993, PVP-Vol.267 Unsteady Flows, pp.: 17-19.

# Appendix A

# ISP-33 Steady State Input Deck

```
= isp-33: pactel (vtt, lappeenranta, finland)
*
* natural circulation test - master input deck
* created: 24-jul-1992  ; ip
* revised: 21-aug-1992  ; ip
* revised:  8-oct-1992  ; ip + mz
* revised: 16-oct-1992  ; og (??? warnings)
*
100  new  transnt
*
120 103020000 0.07 h2o primary
121 601010000 9.8  h2o secondry
*
201  800.0   1.-6   0.1   3  50  40000  40000
*
*********************************************************************
*              m i n o r   e d i t   r e q u e s t s               *
*********************************************************************
20800001 dt 0
20800002 dtcrnt 0
*
301    cntrlvar        100 * core (heater) power
302    mflowj    106040000 * core
303    mflowj    124000000 * core bypass
305    cntrlvar        102 * core power - calorimetric
306    cntrlvar        307 * sg tubes power - calorimetric
310    p         107010000 * upper plenum
311    mflowj    101040000 * downcomer inlet
312    tempf     101010000 * downcomer inlet
313    tempf     107030000 * vessel outlet
320    p         202100000 * pressurizer
321    cntrlvar        172 * pressurizer level
322    cntrlvar        202 * pressurizer heater power
330    p         601010000 * sg-1
331    mflowj    652000000 * sg-1 feedwater
332    cntrlvar        301 * sg-1 tubes power - calorimetric
333    mflowj    301050000 * loop-1
340    p         701010000 * sg-2
341    mflowj    752000000 * sg-2 feedwater
342    cntrlvar        302 * sg-2 tubes power - calorimetric
343    mflowj    401050000 * loop-2
350    p         801010000 * sg-3
351    mflowj    852000000 * sg-3 feedwater
352    cntrlvar        303 * sg-3 tubes power - calorimetric
353    mflowj    501050000 * loop-3
*
* initialization block:
*
355    tempf     104010000 * tcold - core inlet [k]
356    mflowj    123000000 * downcomer mass flow rate [kg/s]
357    cntrlvar        930 * control valve stem position [-]
358    httemp    106000607 * tca17h_1479
359    cntrlvar        931 * control valve stem position [-]
361    mflowj    211000000 * art. prz liquid level control [kg/s]
362    mflowj    221000000 * art. prz pressure control [kg/s]
*
365    voidf     605010000 * separator 1 [-]
366    voidf     705010000 * separator 2 [-]
367    voidf     805010000 * separator 3 [-]
371    mflowj    655000000 * art. sg-1 feedwater
372    mflowj    755000000 * art. sg-2 feedwater
```

```
373    mflowj    855000000 * art. sg-3 feedwater
378    cntrlvar        175 * sg1 collapsed level [m]
379    cntrlvar        176 * sg2 collapsed level [m]
380    cntrlvar        177 * sg3 collapsed level [m]
*
* sg1 recirculation control
381    mflowj    605030000 * separator inlet [kg/s]
382    mflowj    613010000 * level 3 cross [kg/s]
383    mflowj    612010000 * level 2 cross [kg/s]
384    mflowj    611010000 * level 1 cross [kg/s]
*
390    p         900010000 * art. steam line pressure [pa]
391    mflowj    904000000 * steam line flow [kg/s]
392    cntrlvar        925 * total heat losses [kw]
*
* upper head temperature
395    tempf     108030000 * upper head
396    cntrlvar        179 * upper head controller
*
************************************************************************
*                              t r i p s                               *
************************************************************************
*
*
************************************************************************
*   c o n t r o l   v a r i a b l e s   f o r   m i n o r   e d i t   *
************************************************************************
*
* ctv 100: core heater power
20510000 heatpowr  function 1.-3  0  1
20510001 time 0 100
*
* ctv 102: core power
20510200 corepowr  sum      1.-3  0  1
20510201 0 1. q 106010000 1. q 106020000 1. q 106030000 1. q 106040000
20510202   1. q 106050000 1. q 106060000 1. q 106070000 1. q 106080000
20510203   1. q 106090000 1. q 105010000
*
* ctv 104: core heater power per channel (for minor edit only)
20510400 cor3powr  sum      333.  0  1
20510401 0 1. cntrlvar 100
*
* ctv 105: core liquid mass
20510500 coremass  sum      1.-3  0  1
20510501 0  3.03307 rho 106010000  3.03307 rho 106020000  3.03307 rho 106030000
20510502    3.03307 rho 106040000  3.03307 rho 106050000  3.03307 rho 106060000
20510503    3.03307 rho 106070000  3.03307 rho 106080000  3.03307 rho 106090000
*
* ctv 106: sg 1 primary inlet/outlet mass
20510600 sg1iomas  sum      1.-3  0  1
20510601 0  7.01350 rho 321010000  7.01350 rho 322010000  7.01350 rho 323010000
20510602    7.01350 rho 331010000  7.01350 rho 332010000  7.01350 rho 333010000
*
* ctv 107: sg 2 primary inlet/outlet mass
20510700 sg2iomas  sum      1.-3  0  1
20510701 0  7.01350 rho 421010000  7.01350 rho 422010000  7.01350 rho 423010000
20510702    7.01350 rho 431010000  7.01350 rho 432010000  7.01350 rho 433010000
*
* ctv 108: sg 3 primary inlet/outlet mass
20510800 sg3iomas  sum      1.-3  0  1
20510801 0  7.01350 rho 521010000  7.01350 rho 522010000  7.01350 rho 523010000
```

```
20510802    7.01350 rho 531010000  7.01350 rho 532010000  7.01350 rho 533010000
*
* ctv 111: vessel mass (parameter 123: vessmass = ctv 111 + ctv 105)
20511100 vessmass  sum      1.-3  0  1
20511101 0  4.28300 rho 101010000  5.63112 rho 102010000  10.3237 rho 102020000
20511102    4.09536 rho 102030000  1.10916 rho 102040000  7.66400 rho 103010000
20511103    7.66400 rho 103020000  35.2237 rho 103030000  3.98528 rho 103040000
20511104    12.8295 rho 103050000  16.0416 rho 104010000  6.41300 rho 105010000
20511105    31.7800 rho 107010000  25.4169 rho 107020000  25.4169 rho 107030000
20511106    32.2170 rho 108010000  32.2170 rho 108020000  32.2170 rho 108030000
20511107    11.5186 rho 111010000  35.2237 rho 130010000
*
* ctv 112: pressurizer mass (parameter 124: przmass)
20511200 przmass   sum      1.-3  0  1
20511201 0  1.17070 rho 200010000  1.11808 rho 200020000  1.11808 rho 200030000
20511202    .940306 rho 200040000  13.1889 rho 202010000  13.3047 rho 202020000
20511203    13.4528 rho 202030000  13.4886 rho 202040000  13.4886 rho 202050000
20511204    13.4886 rho 202060000  13.4886 rho 202070000  13.4886 rho 202080000
20511205    13.4886 rho 202090000  13.4886 rho 202100000
*
* ctv 113: hot leg 1 mass (parameter 125: hotl1mass)
20511300 hl1mass   sum      1.-3  0  1
20511301 0  2.31817 rho 301010000  1.54932 rho 301020000  1.54932 rho 301030000
20511302    1.54932 rho 301040000  1.54932 rho 301050000  1.70725 rho 301060000
20511303    1.70725 rho 301070000  1.51244 rho 301080000  1.51244 rho 301090000
20511304    1.51244 rho 301100000  1.51244 rho 301110000
*
* ctv 114: hot leg 2 mass (parameter 126: hotl2mass)
20511400 hl2mass   sum      1.-3  0  1
20511401 0  2.76689 rho 401010000  1.54932 rho 401020000  1.54932 rho 401030000
20511402    1.54932 rho 401040000  1.54932 rho 401050000  1.51674 rho 401060000
20511403    1.65559 rho 401070000  1.51244 rho 401080000  1.51244 rho 401090000
20511404    1.51244 rho 401100000  1.51244 rho 401110000
*
* ctv 115: hot leg 3 mass (parameter 127: hotl3mass)
20511500 hl3mass   sum      1.-3  0  1
20511501 0  2.31817 rho 501010000  1.54932 rho 501020000  1.54932 rho 501030000
20511502    1.54932 rho 501040000  1.54932 rho 501050000  1.68142 rho 501060000
20511503    1.68142 rho 501070000  1.51244 rho 501080000  1.51244 rho 501090000
20511504    1.51244 rho 501100000  1.51244 rho 501110000
*
* ctv 116: sg 1 tubes mass (parameter 128: sgtube1mass = ctv 116 + ctv 106)
20511600 sg1tmass  sum      1.-3  0  1
20511601 0  2.50994 rho 325010000  2.50994 rho 325020000  2.50994 rho 325030000
20511602    2.50994 rho 325040000  2.50994 rho 325050000  2.50994 rho 325060000
20511603    2.91997 rho 326010000  2.91997 rho 326020000  2.91997 rho 326030000
20511604    2.91997 rho 326040000  2.91997 rho 326050000  2.91997 rho 326060000
20511605    1.94665 rho 327010000  1.94665 rho 327020000  1.94665 rho 327030000
20511606    1.94665 rho 327040000  1.94665 rho 327050000  1.94665 rho 327060000
*
* ctv 117: sg 2 tubes mass (parameter 129: sgtube2mass = ctv 117 + ctv 107)
20511700 sg2tmass  sum      1.-3  0  1
20511701 0  2.50994 rho 425010000  2.50994 rho 425020000  2.50994 rho 425030000
20511702    2.50994 rho 425040000  2.50994 rho 425050000  2.50994 rho 425060000
20511703    2.91997 rho 426010000  2.91997 rho 426020000  2.91997 rho 426030000
20511704    2.91997 rho 426040000  2.91997 rho 426050000  2.91997 rho 426060000
20511705    1.94665 rho 427010000  1.94665 rho 427020000  1.94665 rho 427030000
20511706    1.94665 rho 427040000  1.94665 rho 427050000  1.94665 rho 427060000
*
* ctv 118: sg 3 tubes mass (parameter 130: sgtube3mass = ctv 118 + ctv 108)
20511800 sg3tmass  sum      1.-3  0  1
```

```
20511801 0  2.50994 rho 525010000  2.50994 rho 525020000  2.50994 rho 525030000
20511802    2.50994 rho 525040000  2.50994 rho 525050000  2.50994 rho 525060000
20511803    2.91997 rho 526010000  2.91997 rho 526020000  2.91997 rho 526030000
20511804    2.91997 rho 526040000  2.91997 rho 526050000  2.91997 rho 526060000
20511805    1.94665 rho 527010000  1.94665 rho 527020000  1.94665 rho 527030000
20511806    1.94665 rho 527040000  1.94665 rho 527050000  1.94665 rho 527060000
*
* ctv 119: cold leg 1 mass (parameter 131: coldl1mass)
20511900 cl1mass   sum      1.-3  0  1
20511901 0  1.51244 rho 351010000  1.51244 rho 351020000  1.51244 rho 351030000
20511902    1.51244 rho 351040000  1.32979 rho 351050000  1.46280 rho 351060000
20511903    1.46280 rho 351070000  1.46280 rho 351080000  1.46280 rho 351090000
20511904    1.25427 rho 351100000  1.25427 rho 351110000  1.71616 rho 351120000
20511905    1.71616 rho 351130000  1.11400 rho 351140000
*
* ctv 120: cold leg 2 mass (parameter 132: coldl2mass)
20512000 cl2mass   sum      1.-3  0  1
20512001 0  1.51244 rho 451010000  1.51244 rho 451020000  1.51244 rho 451030000
20512002    1.51244 rho 451040000  1.43308 rho 451050000  1.46280 rho 451060000
20512003    1.46280 rho 451070000  1.46280 rho 451080000  1.46280 rho 451090000
20512004    1.34465 rho 451100000  1.34465 rho 451110000  1.71616 rho 451120000
20512005    1.71616 rho 451130000  1.11400 rho 451140000
*
* ctv 121: cold leg 3 mass (parameter 133: coldl3mass)
20512100 cl3mass   sum      1.-3  0  1
20512101 0  1.51244 rho 551010000  1.51244 rho 551020000  1.51244 rho 551030000
20512102    1.51244 rho 551040000  1.25233 rho 551050000  1.46280 rho 551060000
20512103    1.46280 rho 551070000  1.46280 rho 551080000  1.46280 rho 551090000
20512104    1.29299 rho 551100000  1.29299 rho 551110000  1.71616 rho 551120000
20512105    1.71616 rho 551130000  1.11400 rho 551140000
*
* ctv 122: primary mass (parameter 122: primass)
20512200 primmass  sum      1.    0  1
20512201 0  1. cntrlvar 105  1. cntrlvar 106  1. cntrlvar 107  1. cntrlvar 108
20512202    1. cntrlvar 111  1. cntrlvar 112  1. cntrlvar 113  1. cntrlvar 114
20512203    1. cntrlvar 115  1. cntrlvar 116  1. cntrlvar 117  1. cntrlvar 118
20512204    1. cntrlvar 119  1. cntrlvar 120  1. cntrlvar 121
*
* ctv 131: sg 1 secondary mass (parameter 134: sgsec1mass)
20513100 sg1smass   sum     1.-3  0  1
20513101 0  78.9228 rho 601010000  71.2339 rho 602010000  48.4271 rho 603010000
20513102    75.2786 rho 605010000  83.7316 rho 606010000  19.7307 rho 611010000
20513103    17.8085 rho 612010000  12.1068 rho 613010000
*
* ctv 132: sg 2 secondary mass (parameter 135: sgsec2mass)
20513200 sg2smass   sum     1.-3  0  1
20513201 0  78.9228 rho 701010000  71.2339 rho 702010000  48.4271 rho 703010000
20513202    75.2786 rho 705010000  83.7316 rho 706010000  19.7307 rho 711010000
20513203    17.8085 rho 712010000  12.1068 rho 713010000
*
* ctv 133: sg 3 secondary mass (parameter 136: sgsec3mass)
20513300 sg3smass   sum     1.-3  0  1
20513301 0  78.9228 rho 801010000  71.2339 rho 802010000  48.4271 rho 803010000
20513302    75.2786 rho 805010000  83.7316 rho 806010000  19.7307 rho 811010000
20513303    17.8085 rho 812010000  12.1068 rho 813010000
*
* ctv 144: dp upper plenum (parameter 44: dp18up = dp18up_8890up_12130)
20514400 dp18up    sum      1.-3  0  1
20514401 0  1.    p   108010000   -1.    p   108030000
20514402    4.38 rho 108010000    4.381 rho 108030000
* center 108010000 = 9.33665 ; center 108030000 = 11.68325
```

```
* korekcija: .44665*9.80665 = 4.38 ; .44675*9.80665 = 4.381
*
* ctv 145: dp uppl-core (parameter 45: dp17upco = dp17up_8890co_6050)
20514500 dp17upco  sum      1.-3  0  1
20514501 0  1.   p    107010000   -1.   p    108010000
20514502    3.04 rho 107010000   -4.38 rho 108010000
* center 107010000 = 6.36 ; center 108010000 = 9.33665
* korekcija: .31*9.80665 = 3.04 ; -.44665*9.80665 = 4.38
*
* ctv 146: dp uppl-lowpl (parameter 46: dp19uplp = dp19up_12130lp_0070)
20514600 dp19uplp  sum      1.-3  0  1
20514601 0  1.   p    103020000   -1.    p    108030000
20514602                          4.381 rho 108030000
* center 103020000 = 0.07 ; center 108030000 = 11.68325
* korekcija:              ; .44675*9.80665 = 4.381
*
* ctv 147: dp core (parameter 47: dp16co = dp16co_6050co_3300)
20514700 dp16co     sum      1.-3  0  1
20514701 0  1.    p   104010000   -1.   p    107010000
20514702   -2.648 rho 104010000   -3.04 rho 107010000
* center 104010000 = 3.03 ; center 107010000 = 6.36
* korekcija: -.27*9.80665 = 2.648 ; -.31*9.80665 = 3.04
*
* ctv 148: dp downc-lowpl (parameter 48: dp23dclp = dp23dc_7900lp_0070)
20514800 dp23dclp  sum      1.-3  0  1
20514801 0  1. p   103010000   -1.   p    111010000
20514802                       2.01 rho 111010000
* center 103010000 = 0.07 ; center 111010000 = 7.695
* korekcija:              ; .205*9.80665 = 2.01
*
* ctv 149: dp pressurizer (parameter 49: dp24pz = dp24pz_16490pz_8040)
20514900 dp24pz     sum      1.-3  0  1
20514901 0  1.    p   202010000  -1.    p    202100000
20514902    3.334 rho 202010000   2.844 rho 202100000
* center 202010000 = 8.38 ; center 202100000 = 16.2
* korekcija: .34*9.80665 = 3.334 ; .29*9.80665 = 2.844
*
* ctv 150: dp uppl-hot leg 1 (parameter 50: dp28uphl1 = dp28up_8890hl1_6790)
20515000 dp28uphl  sum      1.-3  0  1
20515001 0  1.    p   301060000  -1.   p    108010000
20515002    0.294 rho 301060000  -4.38 rho 108010000
* center 301060000 = 6.82 ; center 108010000 = 9.33665
* korekcija: .03*9.80665 = .294 ; -.44665*9.80665 = -4.38
*
* ctv 151: dp hot leg 1 (parameter 51: dp25hl1 = dp25hl1_9500hl1_6790)
20515100 dp25hl1   sum      1.-3  0  1
20515101 0  1.    p   301060000  -1.    p    301110000
20515102    0.294 rho 301060000   2.283 rho 301110000
* center 301060000 = 6.82 ; center 301110000 = 9.2672
* korekcija: .03*9.80665 = .294 ; .2328*9.80665 = 2.283
*
* ctv 152: dp hl1-cl1 (parameter 52: dp30hl1cl1 = dp30hl1_9500cl1_9500)
20515200 dp30hlcl  sum      1.-3  0  1
20515201 0  1.    p   301110000  -1.    p    351010000
20515202   -2.283 rho 301110000   2.283 rho 351010000
* center 301110000 = 9.2672 ; center 351010000 = 9.2672
* korekcija: -.2328*9.80665 = 2.283 ; -.2328*9.80665 = 2.283
*
* ctv 153: dp cold leg 1 (parameter 53: dp26cl1 = dp26cl1_9500cl1_6790)
20515300 dp26cl1   sum      1.-3  0  1
20515301 0  1.    p   351050000  -1.    p    351010000
```

```
20515302    0.294 rho 351050000   2.283 rho 351010000
* center 351050000 = 6.82 ; center 351010000 = 9.2672
* korekcija: .03*9.80665 = .294 ; .2328*9.80665 = 2.283
*
* ctv 154: dp cold leg 1 (parameter 54: dp29dccl1 = dp29dc_7900cl1_6790)
20515400 dp29dccl  sum      1.-3  0  1
20515401 0  1.    p    351050000  -1.    p    111010000
20515402    0.294 rho 351050000   2.01 rho 111010000
* center 351050000 = 6.82 ; center 111010000 = 7.695
* korekcija: .03*9.80665 = .294 ; .205*9.80665 = 2.01
*
* ctv 155: dp uppl-hot leg 2 (parameter 55: dp33uphl2 = dp33up_8890hl2_6790)
20515500 dp33uph2  sum      1.-3  0  1
20515501 0  1.    p    401060000  -1.    p    108010000
20515502    0.294 rho 401060000  -4.38 rho 108010000
* center 401060000 = 6.82 ; center 108010000 = 9.33665
* korekcija: .03*9.80665 = .294 ; -.44665*9.80665 = -4.38
*
* ctv 156: dp hot leg 2 (parameter 56: dp34hl1 = dp34hl2_9500hl2_6790)
20515600 dp34hl2   sum      1.-3  0  1
20515601 0  1.    p    401060000  -1.    p    401110000
20515602    0.294 rho 401060000   2.283 rho 401110000
* center 401060000 = 6.82 ; center 401110000 = 9.2672
* korekcija: .03*9.80665 = .294 ; .2328*9.80665 = 2.283
*
* ctv 157: dp hl2-cl2 (parameter 57: dp32hl2cl2 = dp32hl2_9500cl2_9500)
20515700 dp32h2c2  sum      1.-3  0  1
20515701 0  1.    p    401110000  -1.    p    451010000
20515702   -2.283 rho 401110000   2.283 rho 451010000
* center 401110000 = 9.2672 ; center 451010000 = 9.2672
* korekcija: -.2328*9.80665 = 2.283 ; -.2328*9.80665 = 2.283
*
* ctv 158: dp cold leg 2 (parameter 58: dp35cl2 = dp35cl2_9500cl2_6790)
20515800 dp35cl2   sum      1.-3  0  1
20515801 0  1.    p    451050000  -1.    p    451010000
20515802    0.294 rho 451050000   2.283 rho 451010000
* center 451050000 = 6.82 ; center 451010000 = 9.2672
* korekcija: .03*9.80665 = .294 ; .2328*9.80665 = 2.283
*
* ctv 159: dp cold leg 2 (parameter 59: dp36dccl2 = dp36dc_7900cl2_6790)
20515900 dp36dcc2  sum      1.-3  0  1
20515901 0  1.    p    451050000  -1.    p    111010000
20515902    0.294 rho 451050000   2.01 rho 111010000
* center 451050000 = 6.82 ; center 111010000 = 7.695
* korekcija: .03*9.80665 = .294 ; .205*9.80665 = 2.01
*
* ctv 160: dp uppl-hot leg 3 (parameter 60: dp39uphl3 = dp39up_8890hl3_6790)
20516000 dp39uph3  sum      1.-3  0  1
20516001 0  1.    p    501060000  -1.    p    108010000
20516002    0.294 rho 501060000  -4.38 rho 108010000
* center 501060000 = 6.82 ; center 108010000 = 9.33665
* korekcija: .03*9.80665 = .294 ; -.44665*9.80665 = -4.38
*
* ctv 161: dp hot leg 3 (parameter 61: dp40hl3 = dp40hl3_9500hl3_6790)
20516100 dp40hl3   sum      1.-3  0  1
20516101 0  1.    p    501060000  -1.    p    501110000
20516102    0.294 rho 501060000   2.283 rho 501110000
* center 501060000 = 6.82 ; center 501110000 = 9.2672
* korekcija: .03*9.80665 = .294 ; .2328*9.80665 = 2.283
*
* ctv 162: dp hl3-cl3 (parameter 62: dp38hl3cl3 = dp38hl3_9500cl3_9500)
```

```
20516200 dp38h3c3  sum      1.-3  0  1
20516201 0  1.    p   501110000  -1.    p   551010000
20516202    -2.283 rho 501110000   2.283 rho 551010000
* center 501110000 = 9.2672 ; center 551010000 = 9.2672
* korekcija: -.2328*9.80665 = 2.283 ; -.2328*9.80665 = 2.283
*
* ctv 163: dp cold leg 3 (parameter 63: dp41cl3 = dp41cl3_9500cl3_6790)
20516300 dp41cl3   sum      1.-3  0  1
20516301 0  1.    p   551050000  -1.    p   551010000
20516302    0.294 rho 551050000   2.283 rho 551010000
* center 551050000 = 6.82 ; center 551010000 = 9.2672
* korekcija: .03*9.80665 = .294 ; .2328*9.80665 = 2.283
*
* ctv 164: dp cold leg 3 (parameter 64: dp42dccl3 = dp42dc_7900cl3_6790)
20516400 dp42dcc3  sum      1.-3  0  1
20516401 0  1.    p   551050000  -1.    p   111010000
20516402    0.294 rho 551050000   2.01 rho 111010000
* center 551050000 = 6.82 ; center 111010000 = 7.695
* korekcija: .03*9.80665 = .294 ; .205*9.80665 = 2.01
*
* ctv 165: dp sg 1 secondary (parameter 113: dp27sg1s = dp27sg1_9800sg1_9800)
20516500 dp27sg1s  sum      1.-3  0  1
20516501 0  1.    p   601010000  -1.    p   606010000
20516502    0.545 rho 601010000
* center 601010000 = 9.8556
* korekcija: .0556*9.80665 = .545
*
* ctv 166: dp sg 2 secondary (parameter 114: dp31sg2s = dp31sg2_9800sg2_9800)
20516600 dp31sg2s  sum      1.-3  0  1
20516601 0  1.    p   701010000  -1.    p   706010000
20516602    0.545 rho 701010000
* center 701010000 = 9.8556
* korekcija: .0556*9.80665 = .545
*
* ctv 167: dp sg 3 secondary (parameter 115: dp37sg3s = dp37sg3_9800sg3_9800)
20516700 dp37sg3s  sum      1.-3  0  1
20516701 0  1.    p   801010000  -1.    p   806010000
20516702    0.545 rho 801010000
* center 801010000 = 9.8556
* korekcija: .0556*9.80665 = .545
*
* ctv 171: primary level (parameter 71: from dp19uplp) ; now coll.level ????
20517100 lepr       sum  1.  0  1
20517101 0 2.07  voidf 103030000  .26 voidf 103040000 .3   voidf 103050000
20517102    .66  voidf 104010000 1.16 voidf 107010000 .905 voidf 107020000
20517103    .905 voidf 107030000 1.   cntrlvar     74 1.   cntrlvar     78
*
* ctv 172: pressurizer level (parameter 72: from dp24pz) ; now coll.level ????
20517200 lepz       sum  1.  0  1
20517201 0 .68 voidf 202010000 .88 voidf 202020000 .88 voidf 202030000
20517202   .88 voidf 202040000 .88 voidf 202050000 .88 voidf 202060000
20517203   .88 voidf 202070000 .88 voidf 202080000 .88 voidf 202090000
20517204   .88 voidf 202100000
*
* ctv 173: downcomer level (parameter 73: from dp23dclp) ; now coll.level ????
20517300 ledc       sum  1.  0  1
20517301 0 2.07 voidf 130010000  .26 voidf 102040000 .96 voidf 102030000
20517302   2.42 voidf 102020000 1.32 voidf 102010000 .25 voidf 101010000
20517303    .55 voidf 111010000
*
* ctv  74: upper plenum level (parameter 74: from dp18up) ; now coll.level ????
```

```
20507400 leup      sum  1.  0  1
20507401 0 1.1733 voidf 108010000 1.1733 voidf 108020000 1.0334 voidf 108030000
*
* ctv 175: sg 1 level (parameter 75: from dp27sg1s) ; now collapsed level ????
20517500  lesg1    sum  1.  0  1
20517501  0.0  0.1112  voidf  601010000   0.072  voidf  602010000
20517502       0.0480  voidf  603010000   0.050  voidf  605010000
20517503       0.0852  voidf  606010000
*
* ctv 176: sg 2 level (parameter 76: from dp31sg2s) ; now collapsed level ????
20517600  lesg2    sum  1.  0  1
20517601  0.0  0.1112  voidf  701010000   0.072  voidf  702010000
20517602       0.0480  voidf  703010000   0.050  voidf  705010000
20517603       0.0852  voidf  706010000
*
* ctv 177: sg 3 level (parameter 77: from dp37sg3s) ; now collapsed level ????
20517700  lesg3    sum  1.  0  1
20517701  0.0  0.1112  voidf  801010000   0.072  voidf  802010000
20517702       0.0480  voidf  803010000   0.050  voidf  805010000
20517703       0.0852  voidf  806010000
*
* ctv  78: core level (parameter 78) ; now collapsed level ????
20507800  leco     sum  1.  0  1
20507801 0 .26889 voidf 106010000 .26889 voidf 106020000 .26889 voidf 106030000
20507802   .26889 voidf 106040000 .26889 voidf 106050000 .26889 voidf 106060000
20507803   .26889 voidf 106070000 .26889 voidf 106080000 .26889 voidf 106090000
*
* ctv 301: sg-1 tubes power - primary side
20530100 tub1ppow  sum      1.-3  0  1
20530101 0  1. q 325010000  1. q 325020000  1. q 325030000  1. q 325040000
20530102    1. q 325050000  1. q 325060000  1. q 326010000  1. q 326020000
20530103    1. q 326030000  1. q 326040000  1. q 326050000  1. q 326060000
20530104    1. q 327010000  1. q 327020000  1. q 327030000  1. q 327040000
20530105    1. q 327050000  1. q 327060000
*
* ctv 302: sg-2 tubes power - primary side
20530200 tub2ppow  sum      1.-3  0  1
20530201 0  1. q 425010000  1. q 425020000  1. q 425030000  1. q 425040000
20530202    1. q 425050000  1. q 425060000  1. q 426010000  1. q 426020000
20530203    1. q 426030000  1. q 426040000  1. q 426050000  1. q 426060000
20530204    1. q 427010000  1. q 427020000  1. q 427030000  1. q 427040000
20530205    1. q 427050000  1. q 427060000
*
* ctv 303: sg-3 tubes power - primary side
20530300 tub3ppow  sum      1.-3  0  1
20530301 0  1. q 525010000  1. q 525020000  1. q 525030000  1. q 525040000
20530302    1. q 525050000  1. q 525060000  1. q 526010000  1. q 526020000
20530303    1. q 526030000  1. q 526040000  1. q 526050000  1. q 526060000
20530304    1. q 527010000  1. q 527020000  1. q 527030000  1. q 527040000
20530305    1. q 527050000  1. q 527060000
*
* ctv 304: sg-1 tubes power - secondary side
20530400 tub1spow  sum      1.-3  0  1
20530401 0  1. q 601010000  1. q 602010000  1. q 603010000
*
* ctv 305: sg-2 tubes power - secondary side
20530500 tub2spow  sum      1.-3  0  1
20530501 0  1. q 701010000  1. q 702010000  1. q 703010000
*
* ctv 306: sg-3 tubes power - secondary side
20530600 tub3spow  sum      1.-3  0  1
```

```
20530601 0  1. q 801010000  1. q 802010000  1. q 803010000
*
* ctv 307: sg tubes power - primary side
20530700 sgpripow  sum      1.    0  1
20530701 0  1. cntrlvar 301  1. cntrlvar 302  1. cntrlvar 303
*
* ctv 308: sg tubes power - secondary side
20530800 sgsecpow  sum      1.    0  1
20530801 0  1. cntrlvar 304  1. cntrlvar 305  1. cntrlvar 306
*
************************************************************************
*                                                                      *
*                 r e a c t o r    m o d e l                           *
*                                                                      *
************************************************************************
*
* downcomer top part
1110000  dc-top          branch
1110101  0 .69 11.5186-3 0 90. .69 2.-6 .0823 00
1111101  101000000 111000000 0 0 0 00000
*
* reactor inlet part
1010000  dc-inlet        branch
1010101  0 .25 4.283-3 0 -90. -.25 2.-6 .15 00
1011101  351010000 101000000 0 0 0 00100
1012101  451010000 101000000 0 0 0 00100
1013101  551010000 101000000 0 0 0 00100
1014101  101010000 102000000 0 0 0 00100
*
* reactor downcomer
1020000  downcomr     pipe
1020001  4
1020101  42.66-4 4
1020301  1.32 1  2.42 2  .96 3  .26 4
1020601 -90. 4
1020801  2.-6  .0737 4
1020901  5. 5. 1  0 0 3  * venturi nozzle: ceta=5
1021001  00 4
1021101  00000 3
*
* downcomer to lower plenum                    * ????
1230000  lowpljun     valve
1230101  102010000  130000000  42.66-4 0 0 00000
1230300  srvvlv
1230301  930
1230401  0.01      0.01      0.01   * zaprto
1230402  1.0  10000.0   10000.0   * odprto
*
* ctv-930: stem position, ???? downcomer flow 1.47 kg/s ?
20593000  reg930  sum  1.0  2.589604e-02 0  3  0.01  1.0
20593001  0.01470  -0.01  mflowj  123000000  1.0  cntrlvar  930
*
* lower plenum - connection to downcomer
1300000  dc-lowpl     branch
1300101  1.5328-2 2.298 0 0 -90. -2.07 2.-6 .1397 00
1301101  130010000 103000000 0 .13 .13 00000
*
* lower plenum
1030000  lower-pl     pipe
1030001  5
1030101  1.5328-2 5
```

```
1030301  .5 2  2.298 3  .26 4  .837 5
1030601  0 2  90. 4  45. 5
1030701  0 2  2.07 3  .26 4  .3 5
1030801  2.-6  .1397 5
1030901  0 0 1  .13 .13 2  0 0 3  .13 .13 4
1031001  00 5
1031101  00000 4
*
* below core
1040000  belowcor     branch
1040101  1.671-2   .96 0 0 90. .66 2.-6 13.97-3 00
1041101  103010000 104000000 0 1.3 1.3 00100
*
* core bypass
1050000  core-byp     branch
1050101  26.5-4 2.42 0 0 90. 2.42 2.-6 6.41-3 00
1051101  105010000 107000000 0 0 0 00100
*
1240000  cjun  valve  * ????
1240101  104010000  105000000  26.5-4 0 0 00000
1240300  srvvlv
1240301  931
1240401  0.01      0.01       0.01    * zaprto
1240402  1.0  10000.0   10000.0    * odprto
*
* ctv-931: stem position, ???? 10 % bypas flow 0.147 kg/s ?
20593100  reg931  sum  1.0  1.156322e-02 0  3  0.01  1.0
20593101  0.001470  -0.01  mflowj  124000000  1.0  cntrlvar  931
*
* into core
1460000  core-bot     sngljun
1460101  104010000 106000000 0 1.8 1.8 00100
*
* reactor core
1060000  rx-core      pipe
1060001  9
1060101  .01128 9
1060301  .2688888 9
1060601  90. 9
1060801  2.-6 5.5-3 9
1060901  2.25 2.25 8
1061001  00 9
1061101  00000 8
*
* out of core
1670000  core-top     sngljun
1670101  106010000 107000000 0      3.6 3.6 00100 * choke plate in ceta
*1670101  106010000 107000000 96.9-4 1.8 1.8 00100 * choke plate in area
*
* upper plenum
1070000  upp-plen     pipe
1070001  3
1070101  0 1  2.8085-2 3
1070301  1.16 1  .905 3
1070401  .03178 1  0 3
1070601  90. 3
1070801  2.-6 28.45-3 1  2.-6 .1891 3
1071001  00 3
1071101  00100 2
*
* into hot leg no.1
```

```
1710000  into-hl1     sngljun
1710101  107010000 301000000 0 1. 1. 00100
*
* into hot leg no.2
1720000  into-hl2     sngljun
1720101  107010000 401000000 0 1. 1. 00100
*
* into hot leg no.3
1730000  into-hl3     sngljun
1730101  107010000 501000000 0 1. 1. 00100
*
* into upper head
1780000  intouphe     sngljun
1780101  107010000 108000000 0 0 0 00000
*
* upper head
1080000  upp-head     pipe
1080001  3
1080101  0 3
1080301  1.1733 3
*1080401  32.217-3 3
1080401  32.-3 3
1080601  90. 3
1080801  2.-6 .0966 3
1081001  00 3
1081101  00000 2
*
* upper head mixing valve
1790000  mixvalve     valve
1790101  107010000  180000000  1.8-4  0  0  00100
1790300  srvvlv
1790301  179
*
* ctv 179: upper head temperature controller
20517900   uphetemp sum .1  5.936215e-02 0 3 .01 1.
20517901   545.  -1. tempf 108030000 10. cntrlvar 179
*
* upper head inflow
1800000  upheadin     branch
1800101  0 3.5199 .651-3 0 90. 3.5199 2.-6 0 10
1801101  180010000 108010000 0 0 0 00000
*
**********************************************************************
*                   heat structure input - reactor                   *
**********************************************************************
*
* downcomer inlet
11010000   2 5 2 1 .075
11010100   0 1
11010101   4 .09
11010201   1 4
11010301   1.0  4
11010401   480. 5
11010501   111010000 0 1 1 .69 1
11010502   101010000 0 1 1 .25 2
11010601   0         0 0 1 .69 1
11010602   0         0 0 1 .25 2
11010701   10901 0.12 0 0 1
11010702   10901 0.04 0 0 2
11010801   0 0 0 0 2
*
```

```
* downcomer diffusor
11011000   1 5 1 1 0
11011100   0 1
11011101   4 .004
11011201   1 4
11011301   0 4
11011401   480. 5
11011501   111010000 0 1 1 .2024 1
11011601   111010000 0 1 1 .2024 1
11011701   0 0 0 0 1
11011801   0 0 0 0 1
11011901   0 0 0 0 1
*
* downcomer
11020000   4 5 2 1 .03685
11020100   0 1
11020101   4 .04445
11020201   1 4
11020301   1.0  4
11020401   480. 5
11020501   102010000 0 1 1 1.32 1
11020502   102020000 0 1 1 2.42 2
11020503   102030000 0 1 1  .96 3
11020504   102040000 0 1 1  .26 4
11020601   0         0 0 1 1.32 1
11020602   0         0 0 1 2.42 2
11020603   0         0 0 1  .96 3
11020604   0         0 0 1  .26 4
11020701   10901 0.22 0 0 1
11020702   10901 0.42 0 0 2
11020703   10901 0.16 0 0 3
11020704   10901 0.04 0 0 4
11020801   0 0 0 0 4
*
* lower plenum
11030000   6 5 2 1 .06985
11030100   0 1
11030101   4 .08415
11030201   1 4
11030301   1.0  4
11030401   480. 5
11030501   130010000 0     1 1 2.298 1
11030502   103010000 10000 1 1  .5   3
11030503   103030000 0     1 1 2.298 4
11030504   103040000 0     1 1  .26  5
11030505   103050000 0     1 1  .837 6
11030601   0         0     0 1 2.298 1
11030602   0         0     0 1  .5   3
11030603   0         0     0 1 2.298 4
11030604   0         0     0 1  .26  5
11030605   0         0     0 1  .837 6
11030701   10902 0.34 0 0 1
11030702   10902 0.08 0 0 3
11030703   10902 0.34 0 0 4
11030704   10902 0.04 0 0 5
11030705   10902 0.12 0 0 6
11030801   0 0 0 0 6
*
* below core
11040000   1 5 2 1 .09131
11040100   0 1
```

```
11040101   4 .10955
11040201   1 4
11040301   1.0  4
11040401   480. 5
11040501   104010000 0 1 1 .96 1
11040601   0         0 0 1 .96 1
11040701   10903 0.21 0 0 1
11040801   0 0 0 0 1
*
* unheated part of rods
11041000   1 5 2 1 0.
11041100   0 1
11041101   2 3.9-3  2 3.95-3
11041201   2 2  1 4
11041301   0 4
11041401   480. 5
11041501   0         0 0 1 144. 1 * = 1. * 144
11041601   104010000 0 1 1 144. 1
11041701   0 0 0 0 1
11041901   0 0 0 0 1
*
* core bypass
11050000   1 5 2 1 .09131
11050100   1040
11050400   1040
11050501   105010000 0 1 1 2.42 1
11050601   0         0 0 1 2.42 1
11050701   10903 0.53 0 0 1
11050801   0 0 0 0 1
*
* bypass-core cylinder
11051000   9 3 2 1 .086
11051100   0 1
11051101   2 .088
11051201   1 2
11051301   0 2
11051401   480. 3
11051501   106010000 10000 1 1 .2689 9
11051601   105010000 0     1 1 .2689 9
11051701   0 0 0 0 9
11051801   0 0 0 0 9
11051901   0 0 0 0 9
*
* bypass-core plate
11052000   9 3 1 1 0.
11052100   0 1
11052101   2 .002
11052201   1 2
11052301   0 2
11052401   480. 3
11052501   106010000 10000 1 1 .13875 9
11052601   105010000 0     1 1 .13875 9
11052701   0 0 0 0 9
11052801   0 0 0 0 9
11052901   0 0 0 0 9
*
* reactor core
11060000   11 7  2  1  0.
11060100   0  1
11060101   3  3.55-3  3 4.55-3
11060201   2  3  1 6
```

```
11060301   1. 3  0 6
11060401   580. 7
11060501   0         0     0 1 28.8   1 * =    .2     * 144
11060502   0         0     0 1 38.72 10 * = (2.42/9) * 144
11060503   0         0     0 1 17.28 11 * =    .12    * 144
11060601   104010000 0     1 1 28.8   1
11060602   106010000 10000 1 1 38.72 10
11060603   107010000 0     1 1 17.28 11
11060701   0 0 0 0 1
11060702   100 .0535 0 0  2
11060703   100 .0939 0 0  3
11060704   100 .1274 0 0  4
11060705   100 .1474 0 0  5
11060706   100 .1556 0 0  6
11060707   100 .1474 0 0  7
11060708   100 .1274 0 0  8
11060709   100 .0939 0 0  9
11060710   100 .0535 0 0 10
11060711   0 0 0 0 11
11060901   0 0 0 0 11
*
* tab 100: scram (no scram at initialization)
20210000 power
20210001   0. 165.+3 * isp-33
*20210002 100. 165.+3  120. 230.+3  380. 230.+3  400. 165.+3  * ???? initial.
*
* core internals (hexagonal grid)
11061000   9 3 1 1 0.
11061100   0 1
11061101   2 5.-4
11061201   1 2
11061301   0 2
11061401   480. 3
11061501   106010000 10000 1 1 .8182 9 * 2*sqrt(3)*.0061*144*2.42/9
11061601   106010000 10000 1 1 .8182 9
11061701   0 0 0 0 9
11061801   0 0 0 0 9
11061901   0 0 0 0 9
*
* outer vessel wall
11070000   1 5 2 1 .09131
11070100   1040
11070400   1040
11070501   107010000 0     1 1 1.16 1
11070601   0         0     0 1 1.16 1
11070701   10903 0.26 0 0 1
11070801   0 0 0 0 1
*
* upper plenum
11080000   5 5 2 1 .09455
11080100   0 1
11080101   4 .10955
11080201   1 4
11080301   1.0  4
11080401   480. 5
11080501   107020000 10000 1 1  .905  2
11080502   108010000 10000 1 1 1.1733 5
11080601   0         0     0 1  .905  2
11080602   0         0     0 1 1.1733 5
11080701   10904 0.17 0 0 2
11080702   10904 0.22 0 0 5
```

```
11080801   0 0 0 0 5
*
* upper plenum diffusor
11081000   3 5 2 1 .04245
11081100   0 1
11081101   4 .04468
11081201   1 4
11081301   0 4
11081401   480. 5
11081501   108010000 10000 1 1 1.2067 3
11081601   108010000 10000 1 1 1.2067 3
11081701   0 0 0 0 3
11081801   0 0 0 0 3
11081901   0 0 0 0 3
*
**********************************************************************
*                                                                    *
*                        p r e s s u r i z e r                       *
*                                                                    *
**********************************************************************
*
* hot leg no.1 to surge line connection (fig.8)
1990000  intosurl   sngljun
1990101  301000000 200000000 0 1. 1. 00100
*
* pressurizer surge line
2000000  surgline   pipe
2000001  4
2000101  5.8535-4 4
2000301  2. 1  1.9101 3  1.6064 4
2000601 -90. 1  0 3  90. 4
2000701 -2. 1  0 3  1.29 4
2000801  2.-6 .0273 4
2000901  .5 .5 1  .3 .3 2  .15 .15 3
2001001  00 4
2001101  00000 3
*
* surge line connection
2010000  surjunct   sngljun
2010101  200010000 202000000 0 1. 1. 00100
*
* pressurizer
2020000  pressuri  pipe
2020001  10
2020101  0 3  1.53279-2 10
2020301  .88 10
2020401  13.1889-3 1  13.3047-3 2  13.4528-3  3  0 10
2020601  90. 10
2020701  .68 1  .88 10
2020801  2.-6 .1397 10
2021001  00 10
2021101  00000 9
*
*************** pressuriser for initialization ****************
*
2100000  przv-art  tmdpvol
2100101  10. 10. 0 0 0 0 0 0 00
2100200  1 0 tempf 202010000
2100201 -1. 600. 0  300. 560. 0  400. 400. 0  700. 700. 0
*
2110000  char-prz  tmdpjun
```

```
2110101  210000000 202000000 .05
2110200  1 0 cntrlvar 172 * prz level - collapsed
2110201  0 0 0 0  5.13 1. 0 0  5.18 0 0 0  5.23 -1. 0 0  * isp-33
*
2210000  przoutj   sngljun
2210101  202010000 222000000 0 0 0 00000
2210201    0 -2.61610e-01  1.31406e-03  0
*
2220000  prz-init  tmdpvol
2220101  10. 10. 0 0 0 0 0 0 00
2220200  2
2220201  0 73.8983+5 1. * ???? isp-33
*
***********************************************************************
*                  heat structure input - pressurizer                 *
***********************************************************************
*
* surge line
12000000   4 5 2 1 .01365
12000100   0 1
12000101   4 .01685
12000201   1 4
12000301   1.0 4
12000401   500. 5
12000501   200010000 0     1 1 2.     1
12000502   200020000 10000 1 1 1.9101 3
12000503   200040000 0     1 1 1.536  4
12000601   0         0     0 1 2.     1
12000602   0         0     0 1 1.9101 3
12000603   0         0     0 1 1.536  4
12000701   10915 0.27 0 0 1
12000702   10915 0.26 0 0 3
12000703   10915 0.21 0 0 4
12000801   0 0 0 0 4
*
* pressurizer
12020000  10 5 2 1 .06985
12020100   0 1
12020101   4 .08415
12020201   1 4
12020301   1.0  4
12020401   562. 5
12020501   202010000 10000 1 1 .88 10
12020601   0         0     0 1 .88 10
12020701   10914 0.1 0 0 10
12020801   0 0 0 0 10
*
* pressurizer heaters
12021000   3 5 2 1 0.
12021100   0 1
12021101   4 4.25-3
12021201   1 4
12021301   1. 4
12021401   580. 5
12021501   0         0  0 1  5.28  1
12021502   0         0  0 1  3.24  2
12021503   0         0  0 1  0.63  3
12021601   202010000 0  1 1  5.28  1
12021602   202020000 0  1 1  3.24  2
12021603   202030000 0  1 1  0.63  3
12021701   10202 .51 0 0 1
```

```
12021702   10202 .41 0 0 2
12021703   10202 .08 0 0 3
12021901   0 0 0 0 3
*
* ctv 202: pressurizer heaters
20520200 prz-heat sum  1.0   3354.98     0  * ???? charact. test
20520201 0.0 -1.0 cntrlvar 914 -1.0 cntrlvar 915
*
**********************************************************************
*                                                                    *
*                          c o l d   l e g s                         *
*                                                                    *
**********************************************************************
*
* cold leg no.1
3510000  coldleg1  pipe
3510001  14
3510101  21.631-4 14
3510301  .6992 4  .61476 5  .67625 9  .57985 11   .79338 13  .515 14
3510601 -90.   4  0      5  45.    9  0      11   -90.   13  0    14
3510701 -.6992 4  0      5  .5075  9  0      11   -.75   13  0    14
3510801  2.-6 .05248 14
*        venturi tube: ceta=8.2
3510901  8.2 8.2 1  0 0 3  .2 .2 5  0 0 8  .11 .11 9  0 0 10
3510902  .2 .2 11  .311 .311 12  .2 .2 13
3511001  00 14
3511101  00000 13
*
* cold leg no.2
4510000  coldleg2  pipe
4510001  14
4510101  21.631-4 14
4510301  .6992 4  .66251 5  .67625 9  .62163 11   .79338 13  .515 14
4510601 -90.   4  0      5  45.    9  0      11   -90.   13  0    14
4510701 -.6992 4  0      5  .5075  9  0      11   -.75   13  0    14
4510801  2.-6 .05248 14
*        venturi tube: ceta=8.2
4510901  8.2 8.2 1  0 0 3  .2 .2 4  .27 .27 5  0 0 8  .234 .234 9  0 0 10
4510902  .2 .2 11  .311 .311 12  .2 .2 13
4511001  00 14
4511101  00000 13
*
* cold leg no.3
5510000  coldleg3  pipe
5510001  14
5510101  21.631-4 14
5510301  .6992 4  .57895 5  .67625 9  .59775 11   .79338 13  .515 14
5510601 -90.   4  0      5  45.    9  0      11   -90.   13  0    14
5510701 -.6992 4  0      5  .5075  9  0      11   -.75   13  0    14
5510801  2.-6 .05248 14
*        venturi tube: ceta=8.2
5510901  8.2 8.2 1  0 0 3  .14 .14 5  0 0 8  .17 .17 9  0 0 10
5510902  .2 .2 11  .311 .311 12  .2 .2 13
5511001  00 14
5511101  00000 13
*
**********************************************************************
*                                                                    *
*                           h o t   l e g s                          *
*                                                                    *
**********************************************************************
```

```
*
* hot leg no.1
3010000  hotleg1   pipe
3010001  11
3010101  21.631-4 11
3010301  1.07169 1  .71625 5  .78926 7  .6992 11
3010601  0.      1  -45.   5  0      7  90.   11
3010701  0.      1  -.4825 5  0      7  .6992 11
3010801  2.-6 .05248 11
3010901  .11 .11 1  0 0 4  .267 .267 5  .311 .311 6  .2 .2 7  0 0 10
3011001  00 11
3011101  00000 10
*
* hot leg no.2
4010000  hotleg2   pipe
4010001  11
4010101  21.631-4 11
4010301  1.27913 1  .71625 5  .70119 6  .76538  7  .6992 11
4010601  0.      1  -45.   5  0                 7  90.   11
4010701  0.      1  -.4825 5  0                 7  .6992 11
4010801  2.-6 .05248 11
4010901  .27 .27 1  0 0 4  .25 .25 5  .311 .311 6  .2 .2 7  0 0 10
4011001  00 11
4011101  00000 10
*
* hot leg no.3
5010000  hotleg3   pipe
5010001  11
5010101  21.631-4 11
5010301  1.07169 1  .71625 5  .77732 7  .6992 11
5010601  0.      1  -45.   5  0      7  90.   11
5010701  0.      1  -.4825 5  0      7  .6992 11
5010801  2.-6 .05248 11
5010901  .11 .11 1  0 0 4  .232 .232 5  .311 .311 6  .2 .2 7  0 0 10
5011001  00 11
5011101  00000 10
*
*********************************************************************
*                heat structure input - primary piping              *
*********************************************************************
*
* hot leg no.1
13010000   11 5 2 1 .02624
13010100   0 1
13010101   4 .03015
13010201   1 4
13010301   1.0  4
13010401   480. 5
13010501   301010000 0      1 1  1.07169  1
13010502   301020000 10000  1 1   .71625  5
13010503   301060000 10000  1 1   .78926  7
13010504   301080000 10000  1 1   .6942  11
13010601   0         0      0 1  1.07169  1
13010602   0         0      0 1   .71625  5
13010603   0         0      0 1   .78926  7
13010604   0         0      0 1   .6942  11
13010701   10905 0.14 0 0  1
13010702   10905 0.09 0 0  7
13010703   10905 0.08 0 0 11
13010801   0 0 0 0 11
*
```

```
* hot leg no.2
14010000   11 5 2 1 .02624
14010100   3010
14010400   3010
14010501   401010000 0     1 1  1.27913  1
14010502   401020000 10000 1 1   .71625  5
14010503   401060000 0     1 1   .70119  6
14010504   401070000 0     1 1   .76538  7
14010505   401080000 10000 1 1   .6942  11
14010601   0         0     0 1  1.27913  1
14010602   0         0     0 1   .71625  5
14010603   0         0     0 1   .70119  6
14010604   0         0     0 1   .76538  7
14010605   0         0     0 1   .6942  11
14010701   10908 0.14 0 0  1
14010702   10908 0.09 0 0  7
14010703   10908 0.08 0 0 11
14010801   0 0 0 0 11
*
* hot leg no.3
15010000   11 5 2 1 .02624
15010100   3010
15010400   3010
15010501   501010000 0     1 1  1.07169  1
15010502   501020000 10000 1 1   .71625  5
15010503   501060000 10000 1 1   .77732  7
15010504   501080000 10000 1 1   .6942  11
15010601   0         0     0 1  1.07169  1
15010602   0         0     0 1   .71625  5
15010603   0         0     0 1   .77732  7
15010604   0         0     0 1   .6942  11
15010701   10911 0.14 0 0  1
15010702   10911 0.09 0 0  7
15010703   10911 0.08 0 0 11
15010801   0 0 0 0 11
*
* cold leg no.1
13510000   14 5 2 1 .02624
13510100   3010
13510400   3010
13510501   351010000 10000 1 1 .6942    4
13510502   351050000 0     1 1 .61476   5
13510503   351060000 10000 1 1 .67625   9
13510504   351100000 10000 1 1 .57985  11
13510505   351120000 10000 1 1 .79338  13
13510506   351140000 0     1 1 .515    14
13510601   0         0     0 1 .6942    4
13510602   0         0     0 1 .61476   5
13510603   0         0     0 1 .67625   9
13510604   0         0     0 1 .57985  11
13510605   0         0     0 1 .79338  13
13510606   0         0     0 1 .515    14
13510701   10906 0.07  0 0  11
13510702   10906 0.085 0 0  13
13510703   10906 0.06  0 0  14
13510801   0 0 0 0 14
*
* cold leg no.2
14510000   14 5 2 1 .02624
14510100   3010
14510400   3010
```

```
14510501    451010000 10000 1 1 .6942    4
14510502    451050000 0     1 1 .66251   5
14510503    451060000 10000 1 1 .67625   9
14510504    451100000 10000 1 1 .62163  11
14510505    451120000 10000 1 1 .79338  13
14510506    451140000 0     1 1 .515    14
14510601    0         0     0 1 .6942    4
14510602    0         0     0 1 .66251   5
14510603    0         0     0 1 .67625   9
14510604    0         0     0 1 .62163  11
14510605    0         0     0 1 .79338  13
14510606    0         0     0 1 .515    14
14510701    10909 0.07  0 0  11
14510702    10909 0.085 0 0  13
14510703    10909 0.06  0 0  14
14510801    0 0 0 0 14
*
* cold leg no.3
15510000    14 5 2 1 .02624
15510100    3010
15510400    3010
15510501    551010000 10000 1 1 .6942    4
15510502    551050000 0     1 1 .57895   5
15510503    551060000 10000 1 1 .67625   9
15510504    551100000 10000 1 1 .59775  11
15510505    551120000 10000 1 1 .79338  13
15510506    551140000 0     1 1 .515    14
15510601    0         0     0 1 .6942    4
15510602    0         0     0 1 .57895   5
15510603    0         0     0 1 .67625   9
15510604    0         0     0 1 .59775  11
15510605    0         0     0 1 .79338  13
15510606    0         0     0 1 .515    14
15510701    10912 0.07  0 0  11
15510702    10912 0.085 0 0  13
15510703    10912 0.06  0 0  14
15510801    0 0 0 0 14
*
***********************************************************************
*        additional rcs heat losses - unisolated rcs valves           *
***********************************************************************
*
* rcs heat losses 20 kw: 12.433 kw corresponding to given r5/mod3
*                                  heat sink distribution
*                         7.567 kw (38%) added for unisolated rcs valves
*                                  to obtain total 20 kw (isp-33 data)
*
* hot leg valves: 1,2,3
13011000    3 5 2 1 .02624
13011100    0 1
* 13011101   4 .03015
13011101    4 .05                             * ???? rout = 5 cm
13011201    1 4
13011301    1.0  4
13011401    480. 5
13011501    301070000 100000000 1  1   0.2  3  * ???? l=20 cm (high w/m2 !)
13011601    0         0         0  1   0.2  3  * ???? l=20 cm
13011701    10951 1.0 0 0  1
13011702    10952 1.0 0 0  2
13011703    10953 1.0 0 0  3
13011801    0 0 0 0 3
```

```
*
* ctv 951: hl1 valve heat losses [w]
20595100  hl1vloss  sum  -4.60  -1081.0  1
20595101  -308.0  1.0 tempf 301070000
*
* ctv 952: hl2 valve heat losses [w]
20595200  hl2vloss  sum  -4.60  -1081.0  1
20595201  -308.0  1.0 tempf 401070000
*
* ctv 953: hl3 valve heat losses [w]
20595300  hl3vloss  sum  -4.60  -1081.0  1
20595301  -308.0  1.0 tempf 501070000
*
*
* cold leg valves: 1,2,3
13511000   3 5 2 1 .02624
13511100   3011
13511400   3011
13511501   351130000 100000000  1 1 0.2  3   * ???? l=20 cm
13511601   0         0          0 1 0.2  3   * ???? l=20 cm
13511701   10954 1.0 0 0  1
13511702   10955 1.0 0 0  2
13511703   10956 1.0 0 0  3
13511801   0 0 0 0 3
*
* ctv 954: cl1 valve heat losses [w]
20595400  cl1vloss  sum  -4.80  -1081.0  1
20595401  -308.0  1.0 tempf 351130000
*
* ctv 955: cl2 valve heat losses [w]
20595500  cl2vloss  sum  -4.80  -1081.0  1
20595501  -308.0  1.0 tempf 451130000
*
* ctv 956: cl3 valve heat losses [w]
20595600  cl3vloss  sum  -4.80  -1081.0  1
20595601  -308.0  1.0 tempf 551130000
*
* surge line valve
12001000   1 5 2 1 .01365
12001100   0 1
* 12001101   4 .016
12001101   4 .03                            * ???? rout=3 cm
12001201   1 4
12001301   1.0 4
12001401   480. 5
12001501   200010000 0     1 1 0.2    1  * ???? l=20 cm
12001601   0         0     0 1 0.2    1  * ???? l=20 cm
12001701   10957 1.0 0 0 1
12001801   0 0 0 0 1
*
* ctv 957: sl valve heat losses [w]
* 20595700  slvloss  sum  -4.60  -1081.0  1
20595700  slvloss  sum  -1.53  -360.0  1    * ???? zmanjsano na 1/3
20595701  -308.0  1.0 tempf 200010000
*
************************************************************************
*                                                                      *
*    s t e a m   g e n e r a t o r s   -   p r i m a r y   s i d e    *
*                                                                      *
************************************************************************
*
```

```
*****************************************************************************
*                                 s g   n o . 1                             *
*****************************************************************************
*
* sg no.1 inlet chamber - level 1
3210000  ut11-inl  branch
3210101  .012264 0 5.26-3 0 90. .0632 2.-6 .2128 00
3211101  301010000 321000000 0 0  0  00100
3212101  321010000 325000000 0 1. 1. 00100
*
* sg no.1 inlet chamber - level 2
3220000  ut12-inl  branch
3220101  .012264 0 5.26-3 0 90. .084 2.-6 .2128 00
3221101  321010000 322000000 0 0  0  00100
3222101  322010000 326000000 0 1. 1. 00100
*
* sg no.1 inlet chamber - level 3
3230000  ut13-inl  branch
3230101  .024528 0 10.52-3 0 90. .06 2.-6 .2128 00
3231101  322010000 323000000 0 0  0  00100
3232101  323010000 327000000 0 1. 1. 00100
*
* sg no.1 u-tubes - level 1 (13 tubes)
3250000  utub-1-1  pipe
3250001  6
3250101  17.2552-4 6
3250301  1.4546 6
3250601 -3. 3  3. 6
3250701 -.07 3  .07 6
3250801  1.-6 .013 6
3250901  0 0 2  .175 .175 3  0 0 5
3251001  00 6
3251101  00000 5
*
* sg no.1 u-tubes - level 2 (15 tubes)
3260000  utub-1-2  pipe
3260001  6
3260101  19.9098-4 6
3260301  1.4666 6
3260601  0 6
3260801  1.-6 .013 6
3260901  0 0 2  .18 .18 3  0 0 5
3261001  00 6
3261101  00000 5
*
* sg no.1 u-tubes - level 3 (10 tubes)
3270000  utub-1-3  pipe
3270001  6
3270101  13.2732-4 6
3270301  1.4666 6
3270601  0 6
3270801  1.-6 .013 6
3270901  0 0 2  .18 .18 3  0 0 5
3271001  00 6
3271101  00000 5
*
* sg no.1 outlet chamber - level 1
3310000  ut11-out  branch
3310101  .012264 0 5.26-3 0 -90. -.0632 2.-6 .2128 00
3311101  325010000 331000000 0 1. 1. 00100
3312101  331010000 351000000 0 0  0  00100
```

```
*
* sg no.1 outlet chamber - level 2
3320000  ut12-out  branch
3320101  .012264 0 5.26-3 0 -90. -.084 2.-6 .2128 00
3321101  326010000 332000000 0 1. 1. 00100
3322101  332010000 331000000 0 0  0  00100
*
* sg no.1 outlet chamber - level 3
3330000  ut13-out  branch
3330101  .024528 0 10.52-3 0 -90. -.06 2.-6 .2128 00
3331101  327010000 333000000 0 1. 1. 00100
3332101  333010000 332000000 0 0  0  00100
*
*********************************************************************
*                             s g   n o . 2                         *
*********************************************************************
*
* sg no.2 inlet chamber - level 1
4210000  ut21-inl  branch
4210101  .012264 0 5.26-3 0 90. .0632 2.-6 .2128 00
4211101  401010000 421000000 0 0  0  00100
4212101  421010000 425000000 0 1. 1. 00100
*
* sg no.2 inlet chamber - level 2
4220000  ut22-inl  branch
4220101  .012264 0 5.26-3 0 90. .084 2.-6 .2128 00
4221101  421010000 422000000 0 0  0  00100
4222101  422010000 426000000 0 1. 1. 00100
*
* sg no.2 inlet chamber - level 3
4230000  ut23-inl  branch
4230101  .024528 0 10.52-3 0 90. .06 2.-6 .2128 00
4231101  422010000 423000000 0 0  0  00100
4232101  423010000 427000000 0 1. 1. 00100
*
* sg no.2 u-tubes - level 1 (13 tubes)
4250000  utub-2-1  pipe
4250001  6
4250101  17.2552-4 6
4250301  1.4546 6
4250601 -3. 3  3. 6
4250701 -.07 3  .07 6
4250801  1.-6 .013 6
4250901  0 0 2  .175 .175 3  0 0 5
4251001  00 6
4251101  00000 5
*
* sg no.2 u-tubes - level 2 (15 tubes)
4260000  utub-2-2  pipe
4260001  6
4260101  19.9098-4 6
4260301  1.4666 6
4260601  0 6
4260801  1.-6 .013 6
4260901  0 0 2  .18 .18 3  0 0 5
4261001  00 6
4261101  00000 5
*
* sg no.2 u-tubes - level 3 (10 tubes)
4270000  utub-2-3  pipe
4270001  6
```

```
4270101  13.2732-4 6
4270301  1.4666 6
4270601  0 6
4270801  1.-6 .013 6
4270901  0 0 2  .18 .18 3  0 0 5
4271001  00 6
4271101  00000 5
*
* sg no.2 outlet chamber - level 1
4310000  ut21-out  branch
4310101  .012264 0 5.26-3 0 -90. -.0632 2.-6 .2128 00
4311101  425010000 431000000 0 1. 1. 00100
4312101  431010000 451000000 0 0  0  00100
*
* sg no.2 outlet chamber - level 2
4320000  ut22-out  branch
4320101  .012264 0 5.26-3 0 -90. -.084 2.-6 .2128 00
4321101  426010000 432000000 0 1. 1. 00100
4322101  432010000 431000000 0 0  0  00100
*
* sg no.2 outlet chamber - level 3
4330000  ut23-out  branch
4330101  .024528 0 10.52-3 0 -90. -.06 2.-6 .2128 00
4331101  427010000 433000000 0 1. 1. 00100
4332101  433010000 432000000 0 0  0  00100
*
*************************************************************************
*                                s g   n o . 3                          *
*************************************************************************
*
* sg no.3 inlet chamber - level 1
5210000  ut31-inl  branch
5210101  .012264 0 5.26-3 0 90. .0632 2.-6 .2128 00
5211101  501010000 521000000 0 0  0  00100
5212101  521010000 525000000 0 1. 1. 00100
*
* sg no.3 inlet chamber - level 2
5220000  ut32-inl  branch
5220101  .012264 0 5.26-3 0 90. .084 2.-6 .2128 00
5221101  521010000 522000000 0 0  0  00100
5222101  522010000 526000000 0 1. 1. 00100
*
* sg no.3 inlet chamber - level 3
5230000  ut33-inl  branch
5230101  .024528 0 10.52-3 0 90. .06 2.-6 .2128 00
5231101  522010000 523000000 0 0  0  00100
5232101  523010000 527000000 0 1. 1. 00100
*
* sg no.3 u-tubes - level 1 (13 tubes)
5250000  utub-3-1  pipe
5250001  6
5250101  17.2552-4 6
5250301  1.4546 6
5250601 -3. 3  3. 6
5250701 -.07 3  .07 6
5250801  1.-6 .013 6
5250901  0 0 2  .175 .175 3  0 0 5
5251001  00 6
5251101  00000 5
*
* sg no.3 u-tubes - level 2 (15 tubes)
```

```
5260000  utub-3-2  pipe
5260001  6
5260101  19.9098-4 6
5260301  1.4666 6
5260601  0 6
5260801  1.-6 .013 6
5260901  0 0 2  .18 .18 3  0 0 5
5261001  00 6
5261101  00000 5
*
* sg no.3 u-tubes - level 3 (10 tubes)
5270000  utub-3-3  pipe
5270001  6
5270101  13.2732-4 6
5270301  1.4666 6
5270601  0 6
5270801  1.-6 .013 6
5270901  0 0 2  .18 .18 3  0 0 5
5271001  00 6
5271101  00000 5
*
* sg no.3 outlet chamber - level 1
5310000  ut31-out  branch
5310101  .012264 0 5.26-3 0 -90. -.0632 2.-6 .2128 00
5311101  525010000 531000000 0 1. 1. 00100
5312101  531010000 551000000 0 0  0  00100
*
* sg no.3 outlet chamber - level 2
5320000  ut32-out  branch
5320101  .012264 0 5.26-3 0 -90. -.084 2.-6 .2128 00
5321101  526010000 532000000 0 1. 1. 00100
5322101  532010000 531000000 0 0  0  00100
*
* sg no.3 outlet chamber - level 3
5330000  ut33-out  branch
5330101  .024528 0 10.52-3 0 -90. -.06 2.-6 .2128 00
5331101  527010000 533000000 0 1. 1. 00100
5332101  533010000 532000000 0 0  0  00100
*
*********************************************************************
*                                                                   *
*  s t e a m   g e n e r a t o r s   -   s e c o n d a r y   s i d e *
*                                                                   *
*********************************************************************
*
*********************************************************************
*                             s g   n o . 1                         *
*********************************************************************
*
* sg no.1 secondary side - level 1
6010000  sg-sec11  branch
6010101  0 .1112 78.9228-3 0 90. .1112 2.-6 .011 00 * ???? dh=1.0cm
6011101  601010000 602000000 0 0 0 00000
*
* sg no.1 secondary side - downcomer - level 1
6110000  sg1-dc-1  branch
6110101  0 .1112 19.7307-3 0 -90. -.1112 2.-6 .011 00 * ???? dh=1.0cm
6111101  611010000 601000000 0 0 0 00000
*
* sg no.1 secondary side - level 2
6020000  sg-sec12  branch
```

```
6020101  0 .072 71.2339-3 0 90. .072 2.-6 .011 00 * ???? dh=1.0cm
6021101  602010000 603000000 0 0 0 00000
*
* sg no.1 secondary side - downcomer - level 2
6120000  sg1-dc-2  branch
6120101  0 .072 17.8085-3 0 -90. -.072 2.-6 .011 00 * ???? dh=1.0cm
6121101  612010000 602000000 0 0 0 00000
6122101  612010000 611000000 0 0 0 00000
*
* sg no.1 secondary side - level 3
6030000  sg-sec13  snglvol
6030101  0 .048 48.4271-3 0 90. .048 2.-6 .011 00 * ???? dh=1.0cm
*
* sg no.1 secondary side - downcomer - level 3
6130000  sg1-dc-3  branch
6130101  0 .048 12.1068-3 0 -90. -.048 2.-6 .011 00 * ???? dh=1.0cm
6131101  613010000 603000000 0 0 0 00000
6132101  613010000 612000000 0 0 0 00000
*
* sg no.1 steam separator
6050000  sg1-sepa  separatr
6050101  0 .05 75.2786-3 0 90. .05 2.-6 0 00
6051101  605010000 606000000 0 0 0 01000 * 0.01 * ???? default?
6052101  605000000 613000000 0 0 0 01000 * 0.01
6053101  603010000 605000000 0 0 0 01000
*
* sg no.1 steam dome
6060000  sg1-stdm  snglvol
6060101  0 .0852 83.7316-3 0 90. .0852 2.-6 0 00
*
************************************************************************
*                                s g   n o . 2                         *
************************************************************************
*
* sg no.2 secondary side - level 1
7010000  sg-sec21  branch
7010101  0 .1112 78.9228-3 0 90. .1112 2.-6 .011 00 * ???? dh=1.0cm
7011101  701010000 702000000 0 0 0 00000
*
* sg no.2 secondary side - downcomer - level 1
7110000  sg2-dc-1  branch
7110101  0 .1112 19.7307-3 0 -90. -.1112 2.-6 .011 00 * ???? dh=1.0cm
7111101  711010000 701000000 0 0 0 00000
*
* sg no.2 secondary side - level 2
7020000  sg-sec22  branch
7020101  0 .072 71.2339-3 0 90. .072 2.-6 .011 00 * ???? dh=1.0cm
7021101  702010000 703000000 0 0 0 00000
*
* sg no.2 secondary side - downcomer - level 2
7120000  sg2-dc-2  branch
7120101  0 .072 17.8085-3 0 -90. -.072 2.-6 .011 00 * ???? dh=1.0cm
7121101  712010000 702000000 0 0 0 00000
7122101  712010000 711000000 0 0 0 00000
*
* sg no.2 secondary side - level 3
7030000  sg-sec23  snglvol
7030101  0 .048 48.4271-3 0 90. .048 2.-6 .011 00 * ???? dh=1.0cm
*
* sg no.2 secondary side - downcomer - level 3
7130000  sg2-dc-3  branch
```

```
7130101  0 .048 12.1068-3 0 -90. -.048 2.-6 .011 00 * ???? dh=1.0cm
7131101  713010000 703000000 0 0 0 00000
7132101  713010000 712000000 0 0 0 00000
*
* sg no.2 steam separator
7050000  sg2-sepa  separatr
7050101  0 .05 75.2786-3 0 90. .05 2.-6 0 00
7051101  705010000 706000000 0 0 0 01000 * 0.01 * ???? default?
7052101  705000000 713000000 0 0 0 01000 * 0.01
7053101  703010000 705000000 0 0 0 01000
*
* sg no.2 steam dome
7060000  sg2-stdm  snglvol
7060101  0 .0852 83.7316-3 0 90. .0852 2.-6 0 00
*
***********************************************************************
*                              s g   n o . 3                          *
***********************************************************************
*
* sg no.3 secondary side - level 1
8010000  sg-sec31  branch
8010101  0 .1112 78.9228-3 0 90. .1112 2.-6 .011 00 * ???? dh=1.0cm
8011101  801010000 802000000 0 0 0 00000
*
* sg no.3 secondary side - downcomer - level 1
8110000  sg3-dc-1  branch
8110101  0 .1112 19.7307-3 0 -90. -.1112 2.-6 .011 00 * ???? dh=1.0cm
8111101  811010000 801000000 0 0 0 00000
*
* sg no.3 secondary side - level 2
8020000  sg-sec32  branch
8020101  0 .072 71.2339-3 0 90. .072 2.-6 .011 00 * ???? dh=1.0cm
8021101  802010000 803000000 0 0 0 00000
*
* sg no.3 secondary side - downcomer - level 2
8120000  sg3-dc-2  branch
8120101  0 .072 17.8085-3 0 -90. -.072 2.-6 .011 00 * ???? dh=1.0cm
8121101  812010000 802000000 0 0 0 00000
8122101  812010000 811000000 0 0 0 00000
*
* sg no.3 secondary side - level 3
8030000  sg-sec33  snglvol
8030101  0 .048 48.4271-3 0 90. .048 2.-6 .011 00 * ???? dh=1.0cm
*
* sg no.3 secondary side - downcomer - level 3
8130000  sg3-dc-3  branch
8130101  0 .048 12.1068-3 0 -90. -.048 2.-6 .011 00 * ???? dh=1.0cm
8131101  813010000 803000000 0 0 0 00000
8132101  813010000 812000000 0 0 0 00000
*
* sg no.3 steam separator
8050000  sg3-sepa  separatr
8050101  0 .05 75.2786-3 0 90. .05 2.-6 0 00
8051101  805010000 806000000 0 0 0 01000 * 0.01 * ???? default?
8052101  805000000 813000000 0 0 0 01000 * 0.01
8053101  803010000 805000000 0 0 0 01000
*
* sg no.3 steam dome
8060000  sg3-stdm  snglvol
8060101  0 .0852 83.7316-3 0 90. .0852 2.-6 0 00
*
```

```
*****************************************************************************
*                          sg feedwater control                            *
*****************************************************************************
*
6510000  feedwat1  tmdpvol
6510101  10. 10. 0 0 0 0 0 0 00
6510200  3
6510201  0 45.+5 305.
*
7510000  feedwat2  tmdpvol
7510101  10. 10. 0 0 0 0 0 0 00
7510200  3
7510201  0 45.+5 305.
*
8510000  feedwat3  tmdpvol
8510101  10. 10. 0 0 0 0 0 0 00
8510200  3
8510201  0 45.+5 305.
*
* max. fw capacity for one sg: 0.063 kg/s
* initial isp-33 fw flow: 0.018 kg/s
* isp-33 steady state secondary levels are 0.27 m  -> separator voidf=0.776
* controlled manually within +-0.01 m band (+-0.2 separator total volume)
* (ijs steady heat sink calculation: 0.016 kg/s)
*
6520000  fw1-junc  tmdpjun
6520101  651000000 602000000 25.73-4
6520200  1 0 voidf 605010000
6520201  0.576 0.063 0 0  0.776 0.018 0 0  0.876 0.0 0 0  * ???? isp-33
*       -0.01m           ref.            +0.005m
*
7520000  fw2-junc  tmdpjun
7520101  751000000 702000000 25.73-4
7520200  1 0 voidf 705010000
7520201  0.576 0.063 0 0  0.776 0.018 0 0  0.876 0.0 0 0  * ???? isp-33
*
8520000  fw3-junc  tmdpjun
8520101  851000000 802000000 25.73-4
8520200  1 0 voidf 805010000
8520201  0.576 0.063 0 0  0.776 0.018 0 0  0.876 0.0 0 0  * ???? isp-33
*
*****************************************************************************
*                      secondary pressure control                          *
*****************************************************************************
*
* art. sg-relief initialization:
*               no pi control description available
*               42.0 bar: presumed 2 x 0.05 kg/s (approx. simulating nek
*                                                 2 x 10% sg relief)
*
9000000  steml  branch
9000101  0.022  5.0  0.0  0  0. 0.  2.-6 0 00  * ???? approxim. geom.
9001101  606010000 900000000 0 0 0 00100
9002101  706010000 900000000 0 0 0 00100
9003101  806010000 900000000 0 0 0 00100
*
9040000  sec_porv  valve
9040101  900010000  901000000  7.92034e-05  1.0  1.0  00100  1.0  1.0
9040300  srvvlv
9040301  940
*
```

```
20594000  stempos  function  1.0  1.0  1
20594001  p 900010000  940
*
20294000  reac-t
20294001  41.9e+05  0.0   43.5e+05  1.0
* when the pressure is approaching the setpoint 4.19 mpa the control valve
* starts to open and the pressure reaches 4.35 mpa before the control valve
* is opened for reducing the pressure
*
9010000  steamex  tmdpvol
9010101  10. 10. 0 0 0 0 0 0 00
9010200  2
9010201  0  1.0e+05  1.0
*
***********************************************************************
*                heat structure input - steam generators              *
***********************************************************************
*
* sg no.1 divide plate
13210000   3 5 1 1 0
13210100   0 1
13210101   4 .02
13210201   1 4
13210301   0 4
13210401   450. 5
13210501   321010000  1000000 1 1 .052 3
13210601   331010000  1000000 1 1 .052 3
13210701   0 0 0 0 3
13210801   0 0 0 0 3
13210901   0 0 0 0 3
*
* sg no.2 divide plate
14210000   3 5 1 1 0
14210100   3210
14210400   3210
14210501   421010000  1000000 1 1 .052 3
14210601   431010000  1000000 1 1 .052 3
14210701   0 0 0 0 3
14210801   0 0 0 0 3
14210901   0 0 0 0 3
*
* sg no.3 divide plate
15210000   3 5 1 1 0
15210100   3210
15210400   3210
15210501   521010000  1000000 1 1 .052 3
15210601   531010000  1000000 1 1 .052 3
15210701   0 0 0 0 3
15210801   0 0 0 0 3
15210901   0 0 0 0 3
*
* sg no.1 shell - primary side
13211000   6 5 2 1 .183
13211100   0 1
13211101   4 .203
13211201   1 4
13211301   0 4
13211401   450. 5
13211501   321010000 1000000 1 1 .1 3
13211502   331010000 1000000 1 1 .1 6
13211601   0         0       0 1 .1 3
```

```
13211602   0          0       0 1 .1 6
13211701   0 0 0 0 6
13211801   0 0 0 0 6
*
* sg no.2 shell - primary side
14211000   6 5 2 1 .183
14211100   3211
14211400   3211
14211501   421010000 1000000 1 1 .1 3
14211502   431010000 1000000 1 1 .1 6
14211601   0          0       0 1 .1 3
14211602   0          0       0 1 .1 6
14211701   0 0 0 0 6
14211801   0 0 0 0 6
*
* sg no.3 shell - primary side
15211000   6 5 2 1 .183
15211100   3211
15211400   3211
15211501   521010000 1000000 1 1 .1 3
15211502   531010000 1000000 1 1 .1 6
15211601   0          0       0 1 .1 3
15211602   0          0       0 1 .1 6
15211701   0 0 0 0 6
15211801   0 0 0 0 6
*
* u-tubes sg-1
13250000   18 5 2 1 .0065
13250100   0 1
13250101   4 .008
13250201   1 4
13250301   0 4
13250401   450. 5
13250501   325010000 10000 1 1 18.9098  6 * 1.4546 m * 13 tubes
13250502   326010000 10000 1 1 22.     12 * 1.4666 m * 15 tubes
13250503   327010000 10000 1 1 14.6667 18 * 1.4666 m * 10 tubes
13250601   601010000 0     1 1 18.9098  6
13250602   602010000 0     1 1 22.     12
13250603   603010000 0     1 1 14.6667 18
13250701   0 0 0 0 18
13250801   0 0 0 0 18
13250901   0 0 0 0 18
*
* u-tubes sg-2
14250000   18 5 2 1 .0065
14250100   3250
14250400   3250
14250501   425010000 10000 1 1 18.9098  6 * 1.4546 m * 13 tubes
14250502   426010000 10000 1 1 22.     12 * 1.4666 m * 15 tubes
14250503   427010000 10000 1 1 14.6667 18 * 1.4666 m * 10 tubes
14250601   701010000 0     1 1 18.9098  6
14250602   702010000 0     1 1 22.     12
14250603   703010000 0     1 1 14.6667 18
14250701   0 0 0 0 18
14250801   0 0 0 0 18
14250901   0 0 0 0 18
*
* u-tubes sg-3
15250000   18 5 2 1 .0065
15250100   3250
15250400   3250
```

```
15250501    525010000 10000 1 1 18.9098  6 * 1.4546 m * 13 tubes
15250502    526010000 10000 1 1 22.     12 * 1.4666 m * 15 tubes
15250503    527010000 10000 1 1 14.6667 18 * 1.4666 m * 10 tubes
15250601    801010000 0     1 1 18.9098  6
15250602    802010000 0     1 1 22.     12
15250603    803010000 0     1 1 14.6667 18
15250701    0 0 0 0 18
15250801    0 0 0 0 18
15250901    0 0 0 0 18
*
* sg no.1 shell - secondary side
16010000    5 5 2 1 .183
16010100    3211
16010401    426. 5
16010501    601010000 0 1 1 1.72647 1
16010502    602010000 0 1 1  .59853 2
16010503    603010000 0 1 1  .39283 3
16010504    605010000 0 1 1  .44363 4
16010505    606010000 0 1 1 1.48854 5
16010601    0         0 0 1 1.72647 1
16010602    0         0 0 1  .59853 2
16010603    0         0 0 1  .39283 3
16010604    0         0 0 1  .44363 4
16010605    0         0 0 1 1.48854 5
16010701    10907 0.37  0 0 1
16010702    10907 0.13  0 0 2
16010703    10907 0.085 0 0 3
16010704    10907 0.095 0 0 4
16010705    10907 0.32  0 0 5
16010801    0 0 0 0 5
*
* sg no.2 shell - secondary side
17010000    5 5 2 1 .183
17010100    3211
17010400    6010
17010501    701010000 0 1 1 1.72647 1
17010502    702010000 0 1 1  .59853 2
17010503    703010000 0 1 1  .39283 3
17010504    705010000 0 1 1  .44363 4
17010505    706010000 0 1 1 1.48854 5
17010601    0         0 0 1 1.72647 1
17010602    0         0 0 1  .59853 2
17010603    0         0 0 1  .39283 3
17010604    0         0 0 1  .44363 4
17010605    0         0 0 1 1.48854 5
17010701    10910 0.37  0 0 1
17010702    10910 0.13  0 0 2
17010703    10910 0.085 0 0 3
17010704    10910 0.095 0 0 4
17010705    10910 0.32  0 0 5
17010801    0 0 0 0 5
*
* sg no.3 shell - secondary side
18010000    5 5 2 1 .183
18010100    3211
18010400    6010
18010501    801010000 0 1 1 1.72647 1
18010502    802010000 0 1 1  .59853 2
18010503    803010000 0 1 1  .39283 3
18010504    805010000 0 1 1  .44363 4
18010505    806010000 0 1 1 1.48854 5
```

```
18010601   0         0 0 1 1.72647 1
18010602   0         0 0 1  .59853 2
18010603   0         0 0 1  .39283 3
18010604   0         0 0 1  .44363 4
18010605   0         0 0 1 1.48854 5
18010701   10913 0.37  0 0 1
18010702   10913 0.13  0 0 2
18010703   10913 0.085 0 0 3
18010704   10913 0.095 0 0 4
18010705   10913 0.32  0 0 5
18010801   0 0 0 0 5
*
*****************************************************************
*               initial conditions - primary side                *
*****************************************************************
*                          volumes                               *
*****************************************************************
*
1110200   3  7.43060e+06  5.20089e+02
1010200   3  7.43430e+06  5.26263e+02
1021201   3  7.44034e+06  5.26238e+02  0  0  0  1
1021202   3  7.45457e+06  5.26192e+02  0  0  0  2
1021203   3  7.46777e+06  5.26177e+02  0  0  0  3
1021204   3  7.47254e+06  5.26174e+02  0  0  0  4
1300200   3  7.48155e+06  5.26103e+02
1031201   3  7.48965e+06  5.26088e+02  0  0  0  1
1031202   3  7.48965e+06  5.26071e+02  0  0  0  2
1031203   3  7.48154e+06  5.25997e+02  0  0  0  3
1031204   3  7.47241e+06  5.25987e+02  0  0  0  4
1031205   3  7.47022e+06  5.25961e+02  0  0  0  5
1040200   3  7.46644e+06  5.25940e+02
1050200   3  7.45437e+06  5.36239e+02
1061201   3  7.46277e+06  5.27629e+02  0  0  0  1
1061202   3  7.46064e+06  5.30258e+02  0  0  0  2
1061203   3  7.45852e+06  5.33555e+02  0  0  0  3
1061204   3  7.45642e+06  5.37224e+02  0  0  0  4
1061205   3  7.45433e+06  5.40938e+02  0  0  0  5
1061206   3  7.45226e+06  5.44257e+02  0  0  0  6
1061207   3  7.45020e+06  5.46992e+02  0  0  0  7
1061208   3  7.44816e+06  5.48844e+02  0  0  0  8
1061209   3  7.44612e+06  5.49682e+02  0  0  0  9
1071201   3  7.44075e+06  5.48322e+02  0  0  0  1
1071202   3  7.43304e+06  5.48282e+02  0  0  0  2
1071203   3  7.42628e+06  5.48093e+02  0  0  0  3
1081201   3  7.41844e+06  5.40095e+02  0  0  0  1
1081202   3  7.40953e+06  5.42284e+02  0  0  0  2
1081203   3  7.40067e+06  5.45022e+02  0  0  0  3
1800200   3  7.40939e+06  5.48056e+02
2001201   3  7.43046e+06  5.47000e+02  0  0  0  1
2001202   3  7.43807e+06  5.47000e+02  0  0  0  2
2001203   3  7.43807e+06  5.47000e+02  0  0  0  3
2001204   3  7.43322e+06  5.47000e+02  0  0  0  4
2021201   2  7.42594e+06  5.71600e-04  0  0  0  1
2021202   2  7.42041e+06  9.43500e-04  0  0  0  2
2021203   2  7.41420e+06  9.45000e-04  0  0  0  3
2021204   2  7.40797e+06  8.53800e-04  0  0  0  4
2021205   2  7.40174e+06  8.17200e-04  0  0  0  5
2021206   2  7.39546e+06  1.37700e-04  0  0  0  6
2021207   2  7.39157e+06  1.84000e-01  0  0  0  7
2021208   2  7.39067e+06  1.00000e+00  0  0  0  8
2021209   2  7.39033e+06  9.98000e-01  0  0  0  9
```

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 2021210 | 2 | 7.39000e+06 | 9.99000e-01 | 0 | 0 | 0 | 10 |
| 3011201 | 3 | 7.42281e+06 | 5.47996e+02 | 0 | 0 | 0 | 1 |
| 3011202 | 3 | 7.42460e+06 | 5.47941e+02 | 0 | 0 | 0 | 2 |
| 3011203 | 3 | 7.42819e+06 | 5.47894e+02 | 0 | 0 | 0 | 3 |
| 3011204 | 3 | 7.43179e+06 | 5.47853e+02 | 0 | 0 | 0 | 4 |
| 3011205 | 3 | 7.43539e+06 | 5.47817e+02 | 0 | 0 | 0 | 5 |
| 3011206 | 3 | 7.43717e+06 | 5.47784e+02 | 0 | 0 | 0 | 6 |
| 3011207 | 3 | 7.43715e+06 | 5.47314e+02 | 0 | 0 | 0 | 7 |
| 3011208 | 3 | 7.43452e+06 | 5.47283e+02 | 0 | 0 | 0 | 8 |
| 3011209 | 3 | 7.42927e+06 | 5.47251e+02 | 0 | 0 | 0 | 9 |
| 3011210 | 3 | 7.42403e+06 | 5.47215e+02 | 0 | 0 | 0 | 10 |
| 3011211 | 3 | 7.41879e+06 | 5.47178e+02 | 0 | 0 | 0 | 11 |
| 4011201 | 3 | 7.42281e+06 | 5.47993e+02 | 0 | 0 | 0 | 1 |
| 4011202 | 3 | 7.42459e+06 | 5.47939e+02 | 0 | 0 | 0 | 2 |
| 4011203 | 3 | 7.42819e+06 | 5.47893e+02 | 0 | 0 | 0 | 3 |
| 4011204 | 3 | 7.43178e+06 | 5.47852e+02 | 0 | 0 | 0 | 4 |
| 4011205 | 3 | 7.43538e+06 | 5.47815e+02 | 0 | 0 | 0 | 5 |
| 4011206 | 3 | 7.43717e+06 | 5.47780e+02 | 0 | 0 | 0 | 6 |
| 4011207 | 3 | 7.43715e+06 | 5.47304e+02 | 0 | 0 | 0 | 7 |
| 4011208 | 3 | 7.43451e+06 | 5.47272e+02 | 0 | 0 | 0 | 8 |
| 4011209 | 3 | 7.42927e+06 | 5.47238e+02 | 0 | 0 | 0 | 9 |
| 4011210 | 3 | 7.42403e+06 | 5.47201e+02 | 0 | 0 | 0 | 10 |
| 4011211 | 3 | 7.41878e+06 | 5.47162e+02 | 0 | 0 | 0 | 11 |
| 5011201 | 3 | 7.42281e+06 | 5.47996e+02 | 0 | 0 | 0 | 1 |
| 5011202 | 3 | 7.42460e+06 | 5.47941e+02 | 0 | 0 | 0 | 2 |
| 5011203 | 3 | 7.42819e+06 | 5.47895e+02 | 0 | 0 | 0 | 3 |
| 5011204 | 3 | 7.43179e+06 | 5.47854e+02 | 0 | 0 | 0 | 4 |
| 5011205 | 3 | 7.43539e+06 | 5.47818e+02 | 0 | 0 | 0 | 5 |
| 5011206 | 3 | 7.43717e+06 | 5.47785e+02 | 0 | 0 | 0 | 6 |
| 5011207 | 3 | 7.43715e+06 | 5.47315e+02 | 0 | 0 | 0 | 7 |
| 5011208 | 3 | 7.43452e+06 | 5.47285e+02 | 0 | 0 | 0 | 8 |
| 5011209 | 3 | 7.42927e+06 | 5.47252e+02 | 0 | 0 | 0 | 9 |
| 5011210 | 3 | 7.42403e+06 | 5.47217e+02 | 0 | 0 | 0 | 10 |
| 5011211 | 3 | 7.41879e+06 | 5.47179e+02 | 0 | 0 | 0 | 11 |
| 3511201 | 3 | 7.41875e+06 | 5.27193e+02 | 0 | 0 | 0 | 1 |
| 3511202 | 3 | 7.42393e+06 | 5.27158e+02 | 0 | 0 | 0 | 2 |
| 3511203 | 3 | 7.42939e+06 | 5.27123e+02 | 0 | 0 | 0 | 3 |
| 3511204 | 3 | 7.43484e+06 | 5.27088e+02 | 0 | 0 | 0 | 4 |
| 3511205 | 3 | 7.43756e+06 | 5.27052e+02 | 0 | 0 | 0 | 5 |
| 3511206 | 3 | 7.43556e+06 | 5.27015e+02 | 0 | 0 | 0 | 6 |
| 3511207 | 3 | 7.43159e+06 | 5.26978e+02 | 0 | 0 | 0 | 7 |
| 3511208 | 3 | 7.42761e+06 | 5.26941e+02 | 0 | 0 | 0 | 8 |
| 3511209 | 3 | 7.42363e+06 | 5.26903e+02 | 0 | 0 | 0 | 9 |
| 3511210 | 3 | 7.42163e+06 | 5.26866e+02 | 0 | 0 | 0 | 10 |
| 3511211 | 3 | 7.42163e+06 | 5.26830e+02 | 0 | 0 | 0 | 11 |
| 3511212 | 3 | 7.42454e+06 | 5.26786e+02 | 0 | 0 | 0 | 12 |
| 3511213 | 3 | 7.43039e+06 | 5.26303e+02 | 0 | 0 | 0 | 13 |
| 3511214 | 3 | 7.43331e+06 | 5.26272e+02 | 0 | 0 | 0 | 14 |
| 4511201 | 3 | 7.41875e+06 | 5.27193e+02 | 0 | 0 | 0 | 1 |
| 4511202 | 3 | 7.42394e+06 | 5.27157e+02 | 0 | 0 | 0 | 2 |
| 4511203 | 3 | 7.42939e+06 | 5.27121e+02 | 0 | 0 | 0 | 3 |
| 4511204 | 3 | 7.43485e+06 | 5.27086e+02 | 0 | 0 | 0 | 4 |
| 4511205 | 3 | 7.43757e+06 | 5.27049e+02 | 0 | 0 | 0 | 5 |
| 4511206 | 3 | 7.43557e+06 | 5.27011e+02 | 0 | 0 | 0 | 6 |
| 4511207 | 3 | 7.43159e+06 | 5.26973e+02 | 0 | 0 | 0 | 7 |
| 4511208 | 3 | 7.42761e+06 | 5.26934e+02 | 0 | 0 | 0 | 8 |
| 4511209 | 3 | 7.42363e+06 | 5.26896e+02 | 0 | 0 | 0 | 9 |
| 4511210 | 3 | 7.42163e+06 | 5.26858e+02 | 0 | 0 | 0 | 10 |
| 4511211 | 3 | 7.42163e+06 | 5.26821e+02 | 0 | 0 | 0 | 11 |
| 4511212 | 3 | 7.42454e+06 | 5.26776e+02 | 0 | 0 | 0 | 12 |
| 4511213 | 3 | 7.43039e+06 | 5.26287e+02 | 0 | 0 | 0 | 13 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4511214 | 3 | 7.43331e+06 | 5.26256e+02 | 0 | 0 | 0 | 14 |
| 5511201 | 3 | 7.41875e+06 | 5.27193e+02 | 0 | 0 | 0 | 1 |
| 5511202 | 3 | 7.42393e+06 | 5.27158e+02 | 0 | 0 | 0 | 2 |
| 5511203 | 3 | 7.42939e+06 | 5.27123e+02 | 0 | 0 | 0 | 3 |
| 5511204 | 3 | 7.43484e+06 | 5.27088e+02 | 0 | 0 | 0 | 4 |
| 5511205 | 3 | 7.43756e+06 | 5.27052e+02 | 0 | 0 | 0 | 5 |
| 5511206 | 3 | 7.43556e+06 | 5.27015e+02 | 0 | 0 | 0 | 6 |
| 5511207 | 3 | 7.43159e+06 | 5.26978e+02 | 0 | 0 | 0 | 7 |
| 5511208 | 3 | 7.42761e+06 | 5.26940e+02 | 0 | 0 | 0 | 8 |
| 5511209 | 3 | 7.42363e+06 | 5.26903e+02 | 0 | 0 | 0 | 9 |
| 5511210 | 3 | 7.42164e+06 | 5.26866e+02 | 0 | 0 | 0 | 10 |
| 5511211 | 3 | 7.42163e+06 | 5.26829e+02 | 0 | 0 | 0 | 11 |
| 5511212 | 3 | 7.42454e+06 | 5.26786e+02 | 0 | 0 | 0 | 12 |
| 5511213 | 3 | 7.43039e+06 | 5.26303e+02 | 0 | 0 | 0 | 13 |
| 5511214 | 3 | 7.43331e+06 | 5.26273e+02 | 0 | 0 | 0 | 14 |
| 3210200 | 3 | 7.41594e+06 | 5.47027e+02 | | | | |
| 3220200 | 3 | 7.41539e+06 | 5.46799e+02 | | | | |
| 3230200 | 3 | 7.41485e+06 | 5.46286e+02 | | | | |
| 3251201 | 3 | 7.41568e+06 | 5.35385e+02 | 0 | 0 | 0 | 1 |
| 3251202 | 3 | 7.41566e+06 | 5.30473e+02 | 0 | 0 | 0 | 2 |
| 3251203 | 3 | 7.41564e+06 | 5.28353e+02 | 0 | 0 | 0 | 3 |
| 3251204 | 3 | 7.41562e+06 | 5.27416e+02 | 0 | 0 | 0 | 4 |
| 3251205 | 3 | 7.41560e+06 | 5.26983e+02 | 0 | 0 | 0 | 5 |
| 3251206 | 3 | 7.41558e+06 | 5.26771e+02 | 0 | 0 | 0 | 6 |
| 3261201 | 3 | 7.41504e+06 | 5.35397e+02 | 0 | 0 | 0 | 1 |
| 3261202 | 3 | 7.41502e+06 | 5.30523e+02 | 0 | 0 | 0 | 2 |
| 3261203 | 3 | 7.41500e+06 | 5.28390e+02 | 0 | 0 | 0 | 3 |
| 3261204 | 3 | 7.41498e+06 | 5.27432e+02 | 0 | 0 | 0 | 4 |
| 3261205 | 3 | 7.41495e+06 | 5.26981e+02 | 0 | 0 | 0 | 5 |
| 3261206 | 3 | 7.41493e+06 | 5.26755e+02 | 0 | 0 | 0 | 6 |
| 3271201 | 3 | 7.41459e+06 | 5.35265e+02 | 0 | 0 | 0 | 1 |
| 3271202 | 3 | 7.41457e+06 | 5.30506e+02 | 0 | 0 | 0 | 2 |
| 3271203 | 3 | 7.41454e+06 | 5.28401e+02 | 0 | 0 | 0 | 3 |
| 3271204 | 3 | 7.41452e+06 | 5.27447e+02 | 0 | 0 | 0 | 4 |
| 3271205 | 3 | 7.41449e+06 | 5.26995e+02 | 0 | 0 | 0 | 5 |
| 3271206 | 3 | 7.41447e+06 | 5.26768e+02 | 0 | 0 | 0 | 6 |
| 3310200 | 3 | 7.41582e+06 | 5.27228e+02 | | | | |
| 3320200 | 3 | 7.41524e+06 | 5.27209e+02 | | | | |
| 3330200 | 3 | 7.41468e+06 | 5.27301e+02 | | | | |
| 4210200 | 3 | 7.41593e+06 | 5.47009e+02 | | | | |
| 4220200 | 3 | 7.41538e+06 | 5.46779e+02 | | | | |
| 4230200 | 3 | 7.41484e+06 | 5.46265e+02 | | | | |
| 4251201 | 3 | 7.41568e+06 | 5.35359e+02 | 0 | 0 | 0 | 1 |
| 4251202 | 3 | 7.41566e+06 | 5.30453e+02 | 0 | 0 | 0 | 2 |
| 4251203 | 3 | 7.41564e+06 | 5.28340e+02 | 0 | 0 | 0 | 3 |
| 4251204 | 3 | 7.41562e+06 | 5.27408e+02 | 0 | 0 | 0 | 4 |
| 4251205 | 3 | 7.41560e+06 | 5.26978e+02 | 0 | 0 | 0 | 5 |
| 4251206 | 3 | 7.41558e+06 | 5.26768e+02 | 0 | 0 | 0 | 6 |
| 4261201 | 3 | 7.41504e+06 | 5.35373e+02 | 0 | 0 | 0 | 1 |
| 4261202 | 3 | 7.41502e+06 | 5.30506e+02 | 0 | 0 | 0 | 2 |
| 4261203 | 3 | 7.41500e+06 | 5.28379e+02 | 0 | 0 | 0 | 3 |
| 4261204 | 3 | 7.41497e+06 | 5.27426e+02 | 0 | 0 | 0 | 4 |
| 4261205 | 3 | 7.41495e+06 | 5.26977e+02 | 0 | 0 | 0 | 5 |
| 4261206 | 3 | 7.41493e+06 | 5.26752e+02 | 0 | 0 | 0 | 6 |
| 4271201 | 3 | 7.41459e+06 | 5.35243e+02 | 0 | 0 | 0 | 1 |
| 4271202 | 3 | 7.41456e+06 | 5.30490e+02 | 0 | 0 | 0 | 2 |
| 4271203 | 3 | 7.41454e+06 | 5.28391e+02 | 0 | 0 | 0 | 3 |
| 4271204 | 3 | 7.41451e+06 | 5.27441e+02 | 0 | 0 | 0 | 4 |
| 4271205 | 3 | 7.41449e+06 | 5.26991e+02 | 0 | 0 | 0 | 5 |
| 4271206 | 3 | 7.41447e+06 | 5.26766e+02 | 0 | 0 | 0 | 6 |
| 4310200 | 3 | 7.41582e+06 | 5.27230e+02 | | | | |

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4320200   3  7.41524e+06  5.27210e+02
4330200   3  7.41468e+06  5.27303e+02
5210200   3  7.41594e+06  5.47029e+02
5220200   3  7.41539e+06  5.46801e+02
5230200   3  7.41485e+06  5.46291e+02
5251201   3  7.41568e+06  5.35390e+02  0  0  0  1
5251202   3  7.41566e+06  5.30477e+02  0  0  0  2
5251203   3  7.41564e+06  5.28356e+02  0  0  0  3
5251204   3  7.41562e+06  5.27418e+02  0  0  0  4
5251205   3  7.41560e+06  5.26984e+02  0  0  0  5
5251206   3  7.41558e+06  5.26771e+02  0  0  0  6
5261201   3  7.41505e+06  5.35402e+02  0  0  0  1
5261202   3  7.41502e+06  5.30527e+02  0  0  0  2
5261203   3  7.41500e+06  5.28393e+02  0  0  0  3
5261204   3  7.41498e+06  5.27434e+02  0  0  0  4
5261205   3  7.41495e+06  5.26982e+02  0  0  0  5
5261206   3  7.41493e+06  5.26756e+02  0  0  0  6
5271201   3  7.41459e+06  5.35271e+02  0  0  0  1
5271202   3  7.41457e+06  5.30510e+02  0  0  0  2
5271203   3  7.41454e+06  5.28404e+02  0  0  0  3
5271204   3  7.41452e+06  5.27449e+02  0  0  0  4
5271205   3  7.41449e+06  5.26996e+02  0  0  0  5
5271206   3  7.41447e+06  5.26768e+02  0  0  0  6
5310200   3  7.41582e+06  5.27228e+02
5320200   3  7.41524e+06  5.27209e+02
5330200   3  7.41468e+06  5.27301e+02
*
*****************************************************************
*                           junctions                           *
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1110001 1 0
1111201        2.61764e-06  2.61771e-06  0
1010001 4 0
1011201        2.84410e-01  2.84410e-01  0
1012201        2.81740e-01  2.81740e-01  0
1013201        2.85050e-01  2.85050e-01  0
1014201        4.31590e-01  4.31590e-01  0
1021300   0
1021301        4.31570e-01  4.31570e-01  0  1
1021302        4.31520e-01  4.31520e-01  0  2
1021303        4.31500e-01  4.31500e-01  0  3
1230201    0   4.31490e-01  4.31490e-01  0
1300001 1 0
1301201        1.20070e-01  1.29470e-01  0
1031300   0
1031301        1.20070e-01  1.20070e-01  0  1
1031302        1.20060e-01  1.20060e-01  0  2
1031303        1.20050e-01  1.44140e-01  0  3
1031304        1.20050e-01  1.44140e-01  0  4
1040001 1 0
1041201        1.20040e-01  1.38020e-01  0
1050001 1 0
1051201        7.08984e-02  7.29488e-02  0
1240201    0   6.94311e-02  6.94311e-02  0
1061300   0
1061301        1.47290e-01  1.47290e-01  0  1
1061302        1.48060e-01  1.48060e-01  0  2
1061303        1.49060e-01  1.49060e-01  0  3
1061304        1.50220e-01  1.50220e-01  0  4
1061305        1.51450e-01  1.51450e-01  0  5
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| | | | | | | |
|---|---|---|---|---|---|---|
| 1061306 | | | 1.52590e-01 | 1.52590e-01 | 0 | 6 |
| 1061307 | | | 1.53570e-01 | 1.53570e-01 | 0 | 7 |
| 1061308 | | | 1.54260e-01 | 1.54260e-01 | 0 | 8 |
| 1460201 | | 0 | 1.46800e-01 | 1.46800e-01 | 0 | |
| 1670201 | | 0 | 1.54570e-01 | 1.54570e-01 | 0 | |
| 1071300 | | 0 | | | | |
| 1071301 | | | 7.04819e-02 | 7.04819e-02 | 0 | 1 |
| 1071302 | | | 6.87486e-02 | 8.05652e-02 | 0 | 2 |
| 1710201 | | 0 | 2.98110e-01 | 2.98110e-01 | 0 | |
| 1720201 | | 0 | 2.95330e-01 | 2.95330e-01 | 0 | |
| 1730201 | | 0 | 2.98800e-01 | 2.98800e-01 | 0 | |
| 1780201 | | 0 | -2.34172e-04 | -2.34784e-04 | 0 | |
| 1790201 | | 0 | 3.79289e-02 | 3.79289e-02 | 0 | |
| 1800001 | 1 | 0 | | | | |
| 1801201 | | | 3.79297e-02 | 3.79297e-02 | 0 | |
| 1081300 | | 0 | | | | |
| 1081301 | | | -2.41574e-04 | -2.42224e-04 | 0 | 1 |
| 1081302 | | | -2.49246e-04 | -2.49937e-04 | 0 | 2 |
| 1990201 | | 0 | -2.26005e-05 | -2.26006e-05 | 0 | |
| 2001300 | | 0 | | | | |
| 2001301 | | | -3.37845e-04 | -3.37845e-04 | 0 | 1 |
| 2001302 | | | -4.60400e-04 | -4.60400e-04 | 0 | 2 |
| 2001303 | | | -5.83323e-04 | -5.83323e-04 | 0 | 3 |
| 2010201 | | 0 | -7.08604e-04 | 1.13530e-01 | 0 | |
| 2021300 | | 0 | | | | |
| 2021301 | | | -1.63006e-05 | 1.59050e-01 | 0 | 1 |
| 2021302 | | | -8.79318e-05 | 1.70120e-01 | 0 | 2 |
| 2021303 | | | -9.09411e-05 | 1.69180e-01 | 0 | 3 |
| 2021304 | | | -8.01654e-05 | 1.68750e-01 | 0 | 4 |
| 2021305 | | | -6.81552e-05 | 1.57680e-01 | 0 | 5 |
| 2021306 | | | -3.26816e-04 | 8.44920e-01 | 0 | 6 |
| 2021307 | | | -3.88120e+00 | 2.68635e-03 | 0 | 7 |
| 2021308 | | | -2.35490e-01 | 1.88757e-03 | 0 | 8 |
| 2021309 | | | -2.71480e-01 | 1.60097e-03 | 0 | 9 |
| 3511300 | | 0 | | | | |
| 3511301 | | | 2.84930e-01 | 2.84930e-01 | 0 | 1 |
| 3511302 | | | 2.84910e-01 | 2.84910e-01 | 0 | 2 |
| 3511303 | | | 2.84880e-01 | 2.84880e-01 | 0 | 3 |
| 3511304 | | | 2.84860e-01 | 2.84860e-01 | 0 | 4 |
| 3511305 | | | 2.84840e-01 | 2.84840e-01 | 0 | 5 |
| 3511306 | | | 2.84820e-01 | 2.84820e-01 | 0 | 6 |
| 3511307 | | | 2.84800e-01 | 2.84800e-01 | 0 | 7 |
| 3511308 | | | 2.84780e-01 | 2.84780e-01 | 0 | 8 |
| 3511309 | | | 2.84760e-01 | 2.84760e-01 | 0 | 9 |
| 3511310 | | | 2.84740e-01 | 2.84740e-01 | 0 | 10 |
| 3511311 | | | 2.84720e-01 | 2.84720e-01 | 0 | 11 |
| 3511312 | | | 2.84700e-01 | 2.84700e-01 | 0 | 12 |
| 3511313 | | | 2.84430e-01 | 2.84430e-01 | 0 | 13 |
| 4511300 | | 0 | | | | |
| 4511301 | | | 2.82260e-01 | 2.82260e-01 | 0 | 1 |
| 4511302 | | | 2.82240e-01 | 2.82240e-01 | 0 | 2 |
| 4511303 | | | 2.82220e-01 | 2.82220e-01 | 0 | 3 |
| 4511304 | | | 2.82190e-01 | 2.82190e-01 | 0 | 4 |
| 4511305 | | | 2.82170e-01 | 2.82170e-01 | 0 | 5 |
| 4511306 | | | 2.82150e-01 | 2.82150e-01 | 0 | 6 |
| 4511307 | | | 2.82130e-01 | 2.82130e-01 | 0 | 7 |
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| 4511312 | | | 2.82030e-01 | 2.82030e-01 | 0 | 12 |

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|---|---|---|---|---|---|
| 4511313 | | 2.81760e-01 | 2.81760e-01 | 0 | 13 |
| 5511300 | 0 | | | | |
| 5511301 | | 2.85570e-01 | 2.85570e-01 | 0 | 1 |
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| 5511305 | | 2.85490e-01 | 2.85490e-01 | 0 | 5 |
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| 5511307 | | 2.85450e-01 | 2.85450e-01 | 0 | 7 |
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| 3011300 | 0 | | | | |
| 3011301 | | 2.98070e-01 | 2.98070e-01 | 0 | 1 |
| 3011302 | | 2.98030e-01 | 2.98030e-01 | 0 | 2 |
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| 3011304 | | 2.97970e-01 | 2.97970e-01 | 0 | 4 |
| 3011305 | | 2.97940e-01 | 2.97940e-01 | 0 | 5 |
| 3011306 | | 2.97910e-01 | 2.97910e-01 | 0 | 6 |
| 3011307 | | 2.97560e-01 | 2.97560e-01 | 0 | 7 |
| 3011308 | | 2.97540e-01 | 2.97540e-01 | 0 | 8 |
| 3011309 | | 2.97510e-01 | 2.97510e-01 | 0 | 9 |
| 3011310 | | 2.97480e-01 | 2.97480e-01 | 0 | 10 |
| 4011300 | 0 | | | | |
| 4011301 | | 2.95280e-01 | 2.95280e-01 | 0 | 1 |
| 4011302 | | 2.95240e-01 | 2.95240e-01 | 0 | 2 |
| 4011303 | | 2.95210e-01 | 2.95210e-01 | 0 | 3 |
| 4011304 | | 2.95180e-01 | 2.95180e-01 | 0 | 4 |
| 4011305 | | 2.95140e-01 | 2.95140e-01 | 0 | 5 |
| 4011306 | | 2.95110e-01 | 2.95110e-01 | 0 | 6 |
| 4011307 | | 2.94770e-01 | 2.94770e-01 | 0 | 7 |
| 4011308 | | 2.94740e-01 | 2.94740e-01 | 0 | 8 |
| 4011309 | | 2.94720e-01 | 2.94720e-01 | 0 | 9 |
| 4011310 | | 2.94690e-01 | 2.94690e-01 | 0 | 10 |
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| 5011301 | | 2.98740e-01 | 2.98740e-01 | 0 | 1 |
| 5011302 | | 2.98710e-01 | 2.98710e-01 | 0 | 2 |
| 5011303 | | 2.98680e-01 | 2.98680e-01 | 0 | 3 |
| 5011304 | | 2.98650e-01 | 2.98650e-01 | 0 | 4 |
| 5011305 | | 2.98610e-01 | 2.98610e-01 | 0 | 5 |
| 5011306 | | 2.98580e-01 | 2.98580e-01 | 0 | 6 |
| 5011307 | | 2.98240e-01 | 2.98240e-01 | 0 | 7 |
| 5011308 | | 2.98210e-01 | 2.98210e-01 | 0 | 8 |
| 5011309 | | 2.98190e-01 | 2.98190e-01 | 0 | 9 |
| 5011310 | | 2.98160e-01 | 2.98160e-01 | 0 | 10 |
| 3210001 | 2 0 | | | | |
| 3211201 | | 2.97460e-01 | 2.97460e-01 | 0 | |
| 3212201 | | 1.18000e-01 | 1.18000e-01 | 0 | |
| 3220001 | 2 0 | | | | |
| 3221201 | | 3.58444e-02 | 4.07029e-02 | 0 | |
| 3222201 | | 1.29590e-01 | 1.29590e-01 | 0 | |
| 3230001 | 2 0 | | | | |
| 3231201 | | 1.47885e-02 | 1.60414e-02 | 0 | |
| 3232201 | | 1.36480e-01 | 1.36480e-01 | 0 | |
| 3251300 | 0 | | | | |
| 3251301 | | 1.14960e-01 | 1.14960e-01 | 0 | 1 |
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| 3251303 | | 1.13320e-01 | 1.13320e-01 | 0 | 3 |

| | | | | | |
|---|---|---|---|---|---|
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| 3251305 | | 1.13020e-01 | 1.13020e-01 | 0 | 5 |
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| 3261305 | | 1.24190e-01 | 1.24190e-01 | 0 | 5 |
| 3271300 | 0 | | | | |
| 3271301 | | 1.33170e-01 | 1.33170e-01 | 0 | 1 |
| 3271302 | | 1.31870e-01 | 1.31870e-01 | 0 | 2 |
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| 3311201 | | 1.12970e-01 | 1.12970e-01 | 0 | |
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| 3320001 | 2 0 | | | | |
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| 3332201 | | 1.41812e-02 | 1.53532e-02 | 0 | |
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| 4251301 | | 1.13710e-01 | 1.13710e-01 | 0 | 1 |
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| 4251305 | | 1.11790e-01 | 1.11790e-01 | 0 | 5 |
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| 4261301 | | 1.25180e-01 | 1.25180e-01 | 0 | 1 |
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| 4261305 | | 1.23060e-01 | 1.23060e-01 | 0 | 5 |
| 4271300 | 0 | | | | |
| 4271301 | | 1.32080e-01 | 1.32080e-01 | 0 | 1 |
| 4271302 | | 1.30790e-01 | 1.30790e-01 | 0 | 2 |
| 4271303 | | 1.30240e-01 | 1.30240e-01 | 0 | 3 |
| 4271304 | | 1.30000e-01 | 1.30000e-01 | 0 | 4 |
| 4271305 | | 1.29880e-01 | 1.29880e-01 | 0 | 5 |
| 4310001 | 2 0 | | | | |
| 4311201 | | 1.11750e-01 | 1.11750e-01 | 0 | |
| 4312201 | | 2.82280e-01 | 2.82280e-01 | 0 | |
| 4320001 | 2 0 | | | | |
| 4321201 | | 1.23010e-01 | 1.23010e-01 | 0 | |
| 4322201 | | 3.40504e-02 | 3.85667e-02 | 0 | |
| 4330001 | 2 0 | | | | |
| 4331201 | | 1.29830e-01 | 1.29830e-01 | 0 | |
| 4332201 | | 1.40658e-02 | 1.52227e-02 | 0 | |
| 5210001 | 2 0 | | | | |
| 5211201 | | 2.98130e-01 | 2.98130e-01 | 0 | |

```
5212201         1.18310e-01  1.18310e-01  0
5220001 2 0
5221201         3.59198e-02  4.07927e-02  0
5222201         1.29870e-01  1.29870e-01  0
5230001 2 0
5231201         1.48178e-02  1.60746e-02  0
5232201         1.36750e-01  1.36750e-01  0
5251300   0
5251301         1.15270e-01  1.15270e-01  0  1
5251302         1.14110e-01  1.14110e-01  0  2
5251303         1.13620e-01  1.13620e-01  0  3
5251304         1.13410e-01  1.13410e-01  0  4
5251305         1.13320e-01  1.13320e-01  0  5
5261300   0
5261301         1.26600e-01  1.26600e-01  0  1
5261302         1.25340e-01  1.25340e-01  0  2
5261303         1.24800e-01  1.24800e-01  0  3
5261304         1.24570e-01  1.24570e-01  0  4
5261305         1.24460e-01  1.24460e-01  0  5
5271300   0
5271301         1.33430e-01  1.33430e-01  0  1
5271302         1.32130e-01  1.32130e-01  0  2
5271303         1.31570e-01  1.31570e-01  0  3
5271304         1.31330e-01  1.31330e-01  0  4
5271305         1.31210e-01  1.31210e-01  0  5
5310001 2 0
5311201         1.13270e-01  1.13270e-01  0
5312201         2.85590e-01  2.85590e-01  0
5320001 2 0
5321201         1.24400e-01  1.24400e-01  0
5322201         3.44203e-02  3.90067e-02  0
5330001 2 0
5331201         1.31150e-01  1.31150e-01  0
5332201         1.42091e-02  1.53848e-02  0
*
*****************************************************************
*               initial conditions - secondary side             *
*****************************************************************
*                             volumes                           *
*****************************************************************
*
6010200    2  4.20863e+06  6.38600e-05
6020200    2  4.20791e+06  9.21800e-05
6030200    2  4.20745e+06  4.56300e-05
6050200    2  4.20711e+06  7.76300e-03
6110200    2  4.20862e+06  0.00000e+00
6120200    2  4.20791e+06  0.00000e+00
6130200    2  4.20744e+06  0.00000e+00
6060200    2  4.20695e+06  1.00000e+00
7010200    2  4.20863e+06  6.33200e-05
7020200    2  4.20791e+06  9.14700e-05
7030200    2  4.20745e+06  4.51600e-05
7050200    2  4.20711e+06  7.73100e-03
7110200    2  4.20862e+06  0.00000e+00
7120200    2  4.20791e+06  0.00000e+00
7130200    2  4.20744e+06  0.00000e+00
7060200    2  4.20695e+06  1.00000e+00
8010200    2  4.20863e+06  6.39800e-05
8020200    2  4.20791e+06  9.23200e-05
8030200    2  4.20745e+06  4.57100e-05
8050200    2  4.20711e+06  7.77500e-03
```

```
8110200   2  4.20862e+06  0.00000e+00
8120200   2  4.20791e+06  0.00000e+00
8130200   2  4.20744e+06  0.00000e+00
8060200   2  4.20695e+06  1.00000e+00
9000200   2  4.20694e+06  1.00000e+00
*
*****************************************************************
*                          junctions                            *
*****************************************************************
*
6010001 1 0
6011201        2.83073e-02  2.19560e-01  0
6020001 1 0
6021201        3.46215e-02  1.95920e-01  0
6050001 3 0
6051201       -3.81000e-01  1.93312e-03  0
6052201        1.43540e-01 -9.84810e-01  0
6053201        3.59443e-02  5.40720e-01  0
6110001 1 0
6111201        1.13010e-01  9.31748e-02  0
6120001 2 0
6121201        5.69313e-02  2.23045e-02  0
6122201        1.13010e-01  1.13010e-01  0
6130001 2 0
6131201        8.21489e-03 -3.16753e-02  0
6132201        1.38000e-01  1.38000e-01  0
7010001 1 0
7011201        2.81816e-02  2.18700e-01  0
7020001 1 0
7021201        3.44755e-02  1.95130e-01  0
7050001 3 0
7051201       -3.80690e-01  1.91798e-03  0
7052201        1.42830e-01 -9.84660e-01  0
7053201        3.57666e-02  5.40280e-01  0
7110001 1 0
7111201        1.12510e-01  9.28345e-02  0
7120001 2 0
7121201        5.67114e-02  2.23134e-02  0
7122201        1.12510e-01  1.12510e-01  0
7130001 2 0
7131201        8.07486e-03 -3.15248e-02  0
7132201        1.37420e-01  1.37420e-01  0
8010001 1 0
8011201        2.83344e-02  2.19730e-01  0
8020001 1 0
8021201        3.46484e-02  1.96060e-01  0
8050001 3 0
8051201       -3.81110e-01  1.93451e-03  0
8052201        1.43670e-01 -9.84950e-01  0
8053201        3.59766e-02  5.40850e-01  0
8110001 1 0
8111201        1.13120e-01  9.32478e-02  0
8120001 2 0
8121201        5.69601e-02  2.22911e-02  0
8122201        1.13120e-01  1.13120e-01  0
8130001 2 0
8131201        8.23907e-03 -3.17040e-02  0
8132201        1.38110e-01  1.38110e-01  0
9000001 3 0
9001201        3.91824e-02  3.91824e-02  0
9002201        3.87501e-02  3.87501e-02  0
```

```
9003201        3.92572e-02  3.92572e-02  0
9040201    0  1.17190e-01  1.17190e-01  0
*
******************************************************************
*                         heat losses                            *
******************************************************************
*
* given mod3 sg heat losses distribution: 3 x -2.8 kw
*                                    --> 3 x -2.5 kw for isp-33
*
* ctv 901: downcomer heat losses [w]
20590100  dwchloss  sum  -3.83  -862.0  1
20590101  -308.0  1.0 tempf 102010000
*
* ctv 902: lower plenum heat losses [w]
20590200  lphloss  sum  -6.76  -1521.0  1
20590201  -308.0  1.0 tempf 103010000
*
* ctv 903: core section heat losses [w]
20590300  chloss  sum  -3.04  -715.0  1
20590301  -308.0  1.0 tempf 105010000
*
* ctv 904: upper plenum heat losses [w]
20590400  uphloss  sum  -7.09  -1666.0  1
20590401  -308.0  1.0 tempf 108010000
*
* ctv 905: hl1 heat losses [w]
20590500  hl1hloss  sum  -5.37  -1262.0  1
20590501  -308.0  1.0 tempf 301050000
*
* ctv 906: cl1 heat losses [w]
20590600  cl1hloss  sum  -5.68  -1277.0  1
20590601  -308.0  1.0 tempf 351070000
*
* ctv 907: sg1 heat losses [w]
20590700  sg1hloss  sum  -11.63  -2500.0  1
20590701  -308.0  1.0 tempf 611010000
*
* ctv 908: hl2 heat losses [w]
20590800  hl2hloss  sum  -5.46  -1284.0  1
20590801  -308.0  1.0 tempf 401050000
*
* ctv 909: cl2 heat losses [w]
20590900  cl2hloss  sum  -5.77  -1298.0  1
20590901  -308.0  1.0 tempf 451070000
*
* ctv 910: sg2 heat losses [w]
20591000  sg2hloss  sum  -11.63  -2500.0  1
20591001  -308.0  1.0 tempf 711010000
*
* ctv 911: hl3 heat losses [w]
20591100  hl3hloss  sum  -5.39  -1266.0  1
20591101  -308.0  1.0 tempf 501050000
*
* ctv 912: cl3 heat losses [w]
20591200  cl3hloss  sum  -5.70  -1282.0  1
20591201  -308.0  1.0 tempf 551070000
*
* ctv 913: sg3 heat losses [w]
20591300  sg3hloss  sum  -11.63  -2500.0  1
20591301  -308.0  1.0 tempf 811010000
```

```
*
* ctv 914: pressurizer heat losses [w]
* 20591400  przhloss  sum  -9.24  -2171.0  1
20591400  przhloss  sum  -9.92  -2331.0  1  * +1/5 razlike (160 w) za
*                                            ugl. padanja tlaka v ch. testu
20591401  -308.0  1.0 tempf 202020000
*
* ctv 915: surge line heat losses [w]
20591500  slhloss  sum  -3.50  -788.0  1
20591501  -308.0  1.0 tempf 200020000
*
* ctv 916: total vessel losses [w]
20591600  veshloss  sum  1.  -4764.  1
20591601  0.0  1.0 cntrlvar 901  1.0 cntrlvar 902  1.0 cntrlvar 903
20591602       1.0 cntrlvar 904
*
* ctv 917: total loop 1 losses [w]
20591700  lp1hloss  sum  1.  -2539.  1
20591701  0.0  1.0 cntrlvar 905  1.0 cntrlvar 906  1.0 cntrlvar 951
20591702       1.0 cntrlvar 954
*
* ctv 918: total loop 2 losses [w]
20591800  lp2hloss  sum  1.  -2582.  1
20591801  0.0  1.0 cntrlvar 908  1.0 cntrlvar 909  1.0 cntrlvar 952
20591802       1.0 cntrlvar 955
*
* ctv 919: total loop 3 losses [w]
20591900  lp3hloss  sum  1.  -2548.  1
20591901  0.0  1.0 cntrlvar 911  1.0 cntrlvar 912  1.0 cntrlvar 953
20591902       1.0 cntrlvar 956
*
* ctv 920: total pressurizer losses [w]
20592000  pzshloss  sum  1.  -2959.  1
20592001  0.0  1.0 cntrlvar 914  1.0 cntrlvar 915  1.0 cntrlvar 957
*
* ctv 925: total heat losses [kw]
20592500  sumhloss  sum  1.0e-03  -30.5  1
20592501  0.0  1.0 cntrlvar 907  1.0 cntrlvar 910  1.0 cntrlvar 913 * sgs
20592502       1.0 cntrlvar 916  1.0 cntrlvar 917  1.0 cntrlvar 918 * vess,l1,l2
20592503       1.0 cntrlvar 919  1.0 cntrlvar 920                   * l3,prz
*
*****************************************************************
*            heat  structure  thermal  property  data           *
*****************************************************************
*
20100100  tbl/fctn 1 1 * aisi 3041
20100101  293. 15.0  373. 15.5  473. 17.5  673. 20.0  873. 22.5  1073. 25.5
20100151  293. 3.9+1  373. 3.9+1  473. 4.07+1  573. 4.23+1  673. 4.33+1
20100152 1000. 4.5+1 * ???? initialization
*
20100200  tbl/fctn 2 2 * boron nitride (heater rods) - bethsy data !!!
20100201  293. 1473. 2. 0 0 0 0 0 0
20100251  293. 1473. 1.46+1 1.62-2 0 0 0 0 0 * ???? initialization
*
*****************************************************************
*             fast artifitial sg level control                  *
*****************************************************************
*
6540000  afeed1  tmdpvol
6540101  10. 10. 0 0 0 0 0 0 00
6540200  3 0 tempf 603010000
```

```
6540201   -1.  45.+5 525.
6540202  300.  45.+5 300.
6540203  700.  45.+5 700.
*
6550000  afw1  tmdpjun
6550101  654000000 602000000 25.73-4
6550200  1 0 voidf 605010000
6550201  0.6 1.0 0 0  0.75 0.0 0 0  0.8 0.0 0 0  0.95 -1.0 0 0  *???? ch.test
*
7540000  afeed2  tmdpvol
7540101  10. 10. 0 0 0 0 0 0 00
7540200  3 0 tempf 703010000
7540201   -1.  45.+5 525.
7540202  300.  45.+5 300.
7540203  700.  45.+5 700.
*
7550000  afw2  tmdpjun
7550101  754000000 702000000 25.73-4
7550200  1 0 voidf 705010000
7550201  0.6 1.0 0 0  0.75 0.0 0 0  0.8 0.0 0 0  0.95 -1.0 0 0  *???? ch.test
*
8540000  afeed3  tmdpvol
8540101  10. 10. 0 0 0 0 0 0 00
8540200  3 0 tempf 803010000
8540201   -1.  45.+5 525.
8540202  300.  45.+5 300.
8540203  700.  45.+5 700.
*
8550000  afw3  tmdpjun
8550101  854000000 802000000 25.73-4
8550200  1 0 voidf 805010000
8550201  0.6 1.0 0 0  0.75 0.0 0 0  0.8 0.0 0 0  0.95 -1.0 0 0  *???? ch.test
*
**************************************************
*      additional data or changes for mod3       *
**************************************************
*
* rod bundle interphase friction model
*                                                 pvbfe
*
1040101  1.671-2   .96   0 0  90.  .66   2.-6 13.97-3 00100
1061001                                           00100 9
1071001                                           00100 1  00000 3
6010101  0 .1112 78.9228-3 0  90.  .1112 2.-6 .011    00100
6020101  0 .072  71.2339-3 0  90.  .072  2.-6 .011    00100
6030101  0 .048  48.4271-3 0  90.  .048  2.-6 .011    00100
6110101  0 .1112 19.7307-3 0 -90. -.1112 2.-6 .011    00100
6120101  0 .072  17.8085-3 0 -90. -.072  2.-6 .011    00100
6130101  0 .048  12.1068-3 0 -90. -.048  2.-6 .011    00100
7010101  0 .1112 78.9228-3 0  90.  .1112 2.-6 .011    00100
7020101  0 .072  71.2339-3 0  90.  .072  2.-6 .011    00100
7030101  0 .048  48.4271-3 0  90.  .048  2.-6 .011    00100
7110101  0 .1112 19.7307-3 0 -90. -.1112 2.-6 .011    00100
7120101  0 .072  17.8085-3 0 -90. -.072  2.-6 .011    00100
7130101  0 .048  12.1068-3 0 -90. -.048  2.-6 .011    00100
8010101  0 .1112 78.9228-3 0  90.  .1112 2.-6 .011    00100
8020101  0 .072  71.2339-3 0  90.  .072  2.-6 .011    00100
8030101  0 .048  48.4271-3 0  90.  .048  2.-6 .011    00100
8110101  0 .1112 19.7307-3 0 -90. -.1112 2.-6 .011    00100
8120101  0 .072  17.8085-3 0 -90. -.072  2.-6 .011    00100
8130101  0 .048  12.1068-3 0 -90. -.048  2.-6 .011    00100
```

```
*
* mod3 ccfl data
*
1111110 0.15    0 1. 1.
1011110 0.05248 0 1. 1.
1012110 0.05248 0 1. 1.
1013110 0.05248 0 1. 1.
1014110 0.0737  0 1. 1.
1021401 0.0737  0 1. 1. 3
1230110 0.0737  0 1. 1.
1301110 0.1397  0 1. 1.
1031401 0.1397  0 1. 1. 4
1041110 0.1397  0 1. 1.
1460110 0.0055  0 1. 1.
1240110 0.00641 0 1. 1.
1051110 0.00641 0 1. 1.
1061401 0.0055  0 1. 1. 8
1670110 0.0055  0 1. 1.
1071401 0.02845 0 1. 1. 1
1071402 0.1891  0 1. 1. 2
1710110 0.05248 0 1. 1.
1720110 0.05248 0 1. 1.
1730110 0.05248 0 1. 1.
1780110 0.1891  0 1. 1.
1790110 0.0151  0 1. 1.
1081401 0.1891  0 1. 1. 2
1801110 0.0153  0 1. 1.
1990110 0.0273  0 1. 1.
2001401 0.0273  0 1. 1. 3
2010110 0.0273  0 1. 1.
2021401 0.1397  0 1. 1. 9
3011401 0.05248 0 1. 1. 10
3511401 0.05248 0 1. 1. 13
4011401 0.05248 0 1. 1. 10
4511401 0.05248 0 1. 1. 13
5011401 0.05248 0 1. 1. 10
5511401 0.05248 0 1. 1. 13
3211110 0.05248 0 1. 1.
3212110 0.013   0 1. 1.
3221110 0.2128  0 1. 1.
3222110 0.013   0 1. 1.
3231110 0.2128  0 1. 1.
3232110 0.013   0 1. 1.
3251401 0.013   0 1. 1. 5
3261401 0.013   0 1. 1. 5
3271401 0.013   0 1. 1. 5
3311110 0.013   0 1. 1.
3312110 0.05248 0 1. 1.
3321110 0.013   0 1. 1.
3322110 0.2128  0 1. 1.
3331110 0.013   0 1. 1.
3332110 0.2128  0 1. 1.
4211110 0.05248 0 1. 1.
4212110 0.013   0 1. 1.
4221110 0.2128  0 1. 1.
4222110 0.013   0 1. 1.
4231110 0.2128  0 1. 1.
4232110 0.013   0 1. 1.
4251401 0.013   0 1. 1. 5
4261401 0.013   0 1. 1. 5
4271401 0.013   0 1. 1. 5
```

```
4311110 0.013   0 1. 1.
4312110 0.05248 0 1. 1.
4321110 0.013   0 1. 1.
4322110 0.2128  0 1. 1.
4331110 0.013   0 1. 1.
4332110 0.2128  0 1. 1.
5211110 0.05248 0 1. 1.
5212110 0.013   0 1. 1.
5221110 0.2128  0 1. 1.
5222110 0.013   0 1. 1.
5231110 0.2128  0 1. 1.
5232110 0.013   0 1. 1.
5251401 0.013   0 1. 1. 5
5261401 0.013   0 1. 1. 5
5271401 0.013   0 1. 1. 5
5311110 0.013   0 1. 1.
5312110 0.05248 0 1. 1.
5321110 0.013   0 1. 1.
5322110 0.2128  0 1. 1.
5331110 0.013   0 1. 1.
5332110 0.2128  0 1. 1.
6011110 0.011   0 1. 1.
6021110 0.011   0 1. 1.
6111110 0.011   0 1. 1.
6121110 0.011   0 1. 1.
6122110 0.011   0 1. 1.
6131110 0.011   0 1. 1.
6132110 0.011   0 1. 1.
6051110 1.11861 0 1. 1.
6052110 0.011   0 1. 1.
6053110 0.011   0 1. 1.
7011110 0.011   0 1. 1.
7021110 0.011   0 1. 1.
7111110 0.011   0 1. 1.
7121110 0.011   0 1. 1.
7122110 0.011   0 1. 1.
7131110 0.011   0 1. 1.
7132110 0.011   0 1. 1.
7051110 1.11861 0 1. 1.
7052110 0.011   0 1. 1.
7053110 0.011   0 1. 1.
8011110 0.011   0 1. 1.
8021110 0.011   0 1. 1.
8111110 0.011   0 1. 1.
8121110 0.011   0 1. 1.
8122110 0.011   0 1. 1.
8131110 0.011   0 1. 1.
8132110 0.011   0 1. 1.
8051110 1.11861 0 1. 1.
8052110 0.011   0 1. 1.
8053110 0.011   0 1. 1.
9001110 1.11861 0 1. 1.
9002110 1.11861 0 1. 1.
9003110 1.11861 0 1. 1.
9040110 0.01    0 1. 1.
*1310110 0.0254 0 1. 1. * added at restart
*
* ccfl flags turned on
*                                             fvcahs
*
1111101   101000000 111000000 0       0   0   100000
```

```
1011101  351010000 101000000 0        0   0   100100
1012101  451010000 101000000 0        0   0   100100
1013101  551010000 101000000 0        0   0   100100
1014101  101010000 102000000 0        0   0   100100
1021101                                       100000  3
1230101  102010000 130000000 42.66-4  0   0   100000
1301101  130010000 103000000 0        .13 .13 100000
1031101                                       100000  4
1041101  103010000 104000000 0        1.3 1.3 100100
1240101  104010000 105000000 26.5-4   0   0'  100000
1051101  105010000 107000000 0        0   0   100100
1460101  104010000 106000000 0        1.8 1.8 100100
1061101                                       100000  8
1670101  106010000 107000000 0        3.6 3.6 100100
1071101                                       100100  2
1710101  107010000 301000000 0        1.  1.  100100
1720101  107010000 401000000 0        1.  1.  100100
1730101  107010000 501000000 0        1.  1.  100100
1780101  107010000 108000000 0        0   0   100000
1790101  107010000 180000000 1.8-4    0   0   100100
1081101                                       100000  2
1801101  180010000 108010000 0        0   0   100000
1990101  301000000 200000000 0        1.  1.  100100
2001101                                       100000  3
2010101  200010000 202000000 0        1.  1.  100100
2021101                                       100000  9
3511101                                       100000 13
4511101                                       100000 13
5511101                                       100000 13
3011101                                       100000 10
4011101                                       100000 10
5011101                                       100000 10
3211101  301010000 321000000 0        0   0   100100
3212101  321010000 325000000 0        1.  1.  100100
3221101  321010000 322000000 0        0   0   100100
3222101  322010000 326000000 0        1.  1.  100100
3231101  322010000 323000000 0        0   0   100100
3232101  323010000 327000000 0        1.  1.  100100
3251101                                       100000  5
3261101                                       100000  5
3271101                                       100000  5
3311101  325010000 331000000 0        1.  1.  100100
3312101  331010000 351000000 0        0   0   100100
3321101  326010000 332000000 0        1.  1.  100100
3322101  332010000 331000000 0        0   0   100100
3331101  327010000 333000000 0        1.  1.  100100
3332101  333010000 332000000 0        0   0   100100
4211101  401010000 421000000 0        0   0   100100
4212101  421010000 425000000 0        1.  1.  100100
4221101  421010000 422000000 0        0   0   100100
4222101  422010000 426000000 0        1.  1.  100100
4231101  422010000 423000000 0        0   0   100100
4232101  423010000 427000000 0        1.  1.  100100
4251101                                       100000  5
4261101                                       100000  5
4271101                                       100000  5
4311101  425010000 431000000 0        1.  1.  100100
4312101  431010000 451000000 0        0   0   100100
4321101  426010000 432000000 0        1.  1.  100100
4322101  432010000 431000000 0        0   0   100100
4331101  427010000 433000000 0        1.  1.  100100
```

```
4332101   433010000 432000000 0        0   0   100100
5211101   501010000 521000000 0        0   0   100100
5212101   521010000 525000000 0        1.  1.  100100
5221101   521010000 522000000 0        0   0   100100
5222101   522010000 526000000 0        1.  1.  100100
5231101   522010000 523000000 0        0   0   100100
5232101   523010000 527000000 0        1.  1.  100100
5251101                                        100000  5
5261101                                        100000  5
5271101                                        100000  5
5311101   525010000 531000000 0        1.  1.  100100
5312101   531010000 551000000 0        0   0   100100
5321101   526010000 532000000 0        1.  1.  100100
5322101   532010000 531000000 0        0   0   100100
5331101   527010000 533000000 0        1.  1.  100100
5332101   533010000 532000000 0        0   0   100100
6011101   601010000 602000000 0        0   0   100000
6111101   611010000 601000000 0        0   0   100000
6021101   602010000 603000000 0        0   0   100000
6121101   612010000 602000000 0        0   0   100000
6122101   612010000 611000000 0        0   0   100000
6131101   613010000 603000000 0        0   0   100000
6132101   613010000 612000000 0        0   0   100000
6051101   605010000 606000000 0        0   0   001000 * 0.01 * ???? default?
6052101   605000000 613000000 0        0   0   001000 * 0.01
6053101   603010000 605000000 0        0   0   001000
7011101   701010000 702000000 0        0   0   100000
7111101   711010000 701000000 0        0   0   100000
7021101   702010000 703000000 0        0   0   100000
7121101   712010000 702000000 0        0   0   100000
7122101   712010000 711000000 0        0   0   100000
7131101   713010000 703000000 0        0   0   100000
7132101   713010000 712000000 0        0   0   100000
7051101   705010000 706000000 0        0   0   001000 * 0.01 * ???? default?
7052101   705000000 713000000 0        0   0   001000 * 0.01
7053101   703010000 705000000 0        0   0   001000
8011101   801010000 802000000 0        0   0   100000
8111101   811010000 801000000 0        0   0   100000
8021101   802010000 803000000 0        0   0   100000
8121101   812010000 802000000 0        0   0   100000
8122101   812010000 811000000 0        0   0   100000
8131101   813010000 803000000 0        0   0   100000
8132101   813010000 812000000 0        0   0   100000
8051101   805010000 806000000 0        0   0   001000 * 0.01 * ???? default?
8052101   805000000 813000000 0        0   0   001000 * 0.01
8053101   803010000 805000000 0        0   0   001000
9001101   606010000 900000000 0        0   0   100100
9002101   706010000 900000000 0        0   0   100100
9003101   806010000 900000000 0        0   0   100100
9040101   900010000 901000000 7.92034-5 1. 1.  100100 1. 1.
*
*************************************************
*          mod3 heat structure changes          *
*************************************************
*
11010801    0 10. 10. 0 0 0 0 1.  2
11011801    0 10. 10. 0 0 0 0 1.  1
11011901    0 10. 10. 0 0 0 0 1.  1
11020801    0 10. 10. 0 0 0 0 1.  4
11030801    0 10. 10. 0 0 0 0 1.  6
11040801    0 10. 10. 0 0 0 0 1.  1
```

```
11041901   0 10.  10.  0 0 0 0 1.  1
11050801   0 10.  10.  0 0 0 0 1.  1
11051801   0 10.  10.  0 0 0 0 1.  9
11051901   0 10.  10.  0 0 0 0 1.  9
11052801   0 10.  10.  0 0 0 0 1.  9
11052901   0 10.  10.  0 0 0 0 1.  9
11060901   0 10.  10.  0 0 0 0 1. 11
11061801   0 10.  10.  0 0 0 0 1.  9
11061901   0 10.  10.  0 0 0 0 1.  9
11070801   0 10.  10.  0 0 0 0 1.  1
11080801   0 10.  10.  0 0 0 0 1.  5
11081801   0 10.  10.  0 0 0 0 1.  3
11081901   0 10.  10.  0 0 0 0 1.  3
12000801   0 10.  10.  0 0 0 0 1.  4
12001801   0 10.  10.  0 0 0 0 1.  1
12020801   0 10.  10.  0 0 0 0 1. 10
12021901   0 10.  10.  0 0 0 0 1.  3
13010801   0 10.  10.  0 0 0 0 1. 11
13011801   0 10.  10.  0 0 0 0 1.  3
14010801   0 10.  10.  0 0 0 0 1. 11
15010801   0 10.  10.  0 0 0 0 1. 11
13210801   0 10.  10.  0 0 0 0 1.  3
13210901   0 10.  10.  0 0 0 0 1.  3
14210801   0 10.  10.  0 0 0 0 1.  3
14210901   0 10.  10.  0 0 0 0 1.  3
15210801   0 10.  10.  0 0 0 0 1.  3
15210901   0 10.  10.  0 0 0 0 1.  3
13211801   0 10.  10.  0 0 0 0 1.  6
14211801   0 10.  10.  0 0 0 0 1.  6
15211801   0 10.  10.  0 0 0 0 1.  6
13510801   0 10.  10.  0 0 0 0 1. 14
13511801   0 10.  10.  0 0 0 0 1.  3
14510801   0 10.  10.  0 0 0 0 1. 14
15510801   0 10.  10.  0 0 0 0 1. 14
13250801   0 10.  10.  0 0 0 0 1. 18
13250901   0 10.  10.  0 0 0 0 1. 18
14250801   0 10.  10.  0 0 0 0 1. 18
14250901   0 10.  10.  0 0 0 0 1. 18
15250801   0 10.  10.  0 0 0 0 1. 18
15250901   0 10.  10.  0 0 0 0 1. 18
16010801   0 10.  10.  0 0 0 0 1.  5
17010801   0 10.  10.  0 0 0 0 1.  5
18010801   0 10.  10.  0 0 0 0 1.  5
*
*****************************************************************
*                  ????  replacement block                      *
*****************************************************************
*
* prepare restart at 0 seconds
201  .1    1.-6   .1   3   2000  20000   20000
*
* restore volumetric heat capacities
20100151  293. 3.90+6  373. 3.90+6  473. 4.07+6  573. 4.23+6  673. 4.33+6
20100152 1000. 4.50+6
20100251  293. 1473. 1.46+6 1.62+3 0. 0. 0. 0. 0.
.
```

# Appendix B

## ISP-33 Run Input Deck

```
=isp-33: pactel (vtt, lappeenranta, finland)
* natural circulation test
*
100  restart transnt
103  0
201  1200.   1.-6   0.1  3   300  12000   12000
202  8000.   1.-6   0.1  3   300   9000    9000
*
*************************************************************************
*               m i n o r   e d i t   r e q u e s t s                   *
*************************************************************************
*
301    cntrlvar        100 * core (heater) power
302    mflowj    101040000 * downcomer inlet
303    tempf     101010000 * downcomer inlet
304    tempf     107030000 * vessel outlet
305    p         202100000 * pressurizer
306    cntrlvar        172 * pressurizer level
307    cntrlvar        202 * pressurizer heater power
308    p         606010000 * secondary
309    mflowj    652000000 * sg-1 feedwater
310    mflowj    301050000 * loop-1
311    mflowj    401050000 * loop-2
312    mflowj    501050000 * loop-3
313    mflowj    904000000 * steam out
314    mflowj    131000000 * break flow
315    cntrlvar        190 * integral break flow
316    cntrlvar        999 * maxcladt
317    cntrlvar        171 * primary level
318    cntrlvar        153 * dp 2 cold leg 1
319    mflowj    201000000 * surge line flow
*
*************************************************************************
*                               t r i p s                               *
*************************************************************************
*
401  p        202100000  ge  null 0  73.6+5  n * low.limit - prz press.control
402  p        202100000  ge  null 0  75.0+5  n * upp.limit - prz press.control
*
501  time             0  ge  null 0   1200.  n * draining starts,prz heaters off
599  cntrlvar       999  ge  null 0    623.  n * cladding overheat
*
600  599 * stop trip - cladding overheat
*
* prz pressure control (2 or 6 kw)
701  702  or  -401  n
702  701  and -402  n
*
*************************************************************************
*                            c o n t r o l s                            *
*************************************************************************
*
20517900  uphetemp constant  2.500000e-02  * upper head temperature
20593000  reg930   constant  2.589604e-02  * rcs flow
20593100  reg931   constant  1.156322e-02  * core bypass flow
*
* ctv 199: switch pressurizer heaters off at first draining
20519900 przh-swi tripunit  1. 0  0
20519901 -501
*
* ctv 200: switch higher level of pressurizer heaters
```

```
20520000 przhswit tripunit  1. 0  0
20520001 702
*
* ctv 201: pressurizer heaters
20520100 przheats sum  1.+3  2.+3  0
20520101 2.  4. cntrlvar 200
*
* ctv 202: pressurizer heaters final switch
20520200 prz-heat mult  1.  2.+3  0
20520201 cntrlvar 199  cntrlvar 201
*
* ctv 999: maximum cladding outer temperature
20599900 maxcladt stdfnctn  1.  0  1
20599901 max  httemp 106000107  httemp 106000207  httemp 106000307
20599902      httemp 106000407  httemp 106000507  httemp 106000607
20599903      httemp 106000707  httemp 106000807  httemp 106000907
*
*************************************************************************
*           h y d r o d y n a m i c   c o m p o n e n t s               *
*************************************************************************
*
2100000  noname  delete * art. pressurizer control
2110000  noname  delete
2210000  noname  delete
2220000  noname  delete
*
6540000  noname  delete * art. feedwater
6550000  noname  delete
7540000  noname  delete
7550000  noname  delete
8540000  noname  delete
8550000  noname  delete
*
* drain valve
1310000  drain     tmdpjun
1310101  130010000 132000000 5.067-4
1310200  1 501
1310201    -1. 0   0 0     0  0   0 0                         * drain: amount duration
1310202     0  .33 0 0   182. .33 0 0   182. 0 0 0   900. 0 0 0 * 60 kg 182 sec
1310203   900. 1.  0 0   960. 1.  0 0   960. 0 0 0  1800. 0 0 0 * 60 kg  60 sec
1310204  1800. 1.  0 0  1860. 1.  0 0  1860. 0 0 0  2700. 0 0 0 *  -"-    -"-
1310205  2700. 1.  0 0  2760. 1.  0 0  2760. 0 0 0  3600. 0 0 0 *  -"-    -"-
1310206  3600. 1.  0 0  3660. 1.  0 0  3660. 0 0 0  4500. 0 0 0 *  -"-    -"-
1310207  4500. 1.  0 0  4560. 1.  0 0  4560. 0 0 0  5400. 0 0 0 *  -"-    -"-
1310208  5400. 1.  0 0  5460. 1.  0 0  5460. 0 0 0  6300. 0 0 0 *  -"-    -"-
1310209  6300. 1.  0 0  6360. 1.  0 0  6360. 0 0 0  7200. 0 0 0 *  etc.   etc.
*
* ctv 190: integral of break mass flow [kg]
20519000 intbreak  integral 1.  0  0
20519001 mflowj 131000000
*
1320000  draintnk     tmdpvol
1320101  10. 10. 0 0 0 0 0 0 00
1320200  2
1320201  0 1.+5 1.
*
* steam line
19000000   1 5 2 1 .0485
19000100   0 1
19000101   4 .05715
19000201   1 4
```

```
19000301   1.0  4
19000401   480. 5
19000501   900010000 0 1 1 5. 1
19000601   0         0 0 1 5. 1
19000701   0 0 0 0 1
19000801   0 10. 10. 0 0 0 0 1. 1
.
```

# Appendix C

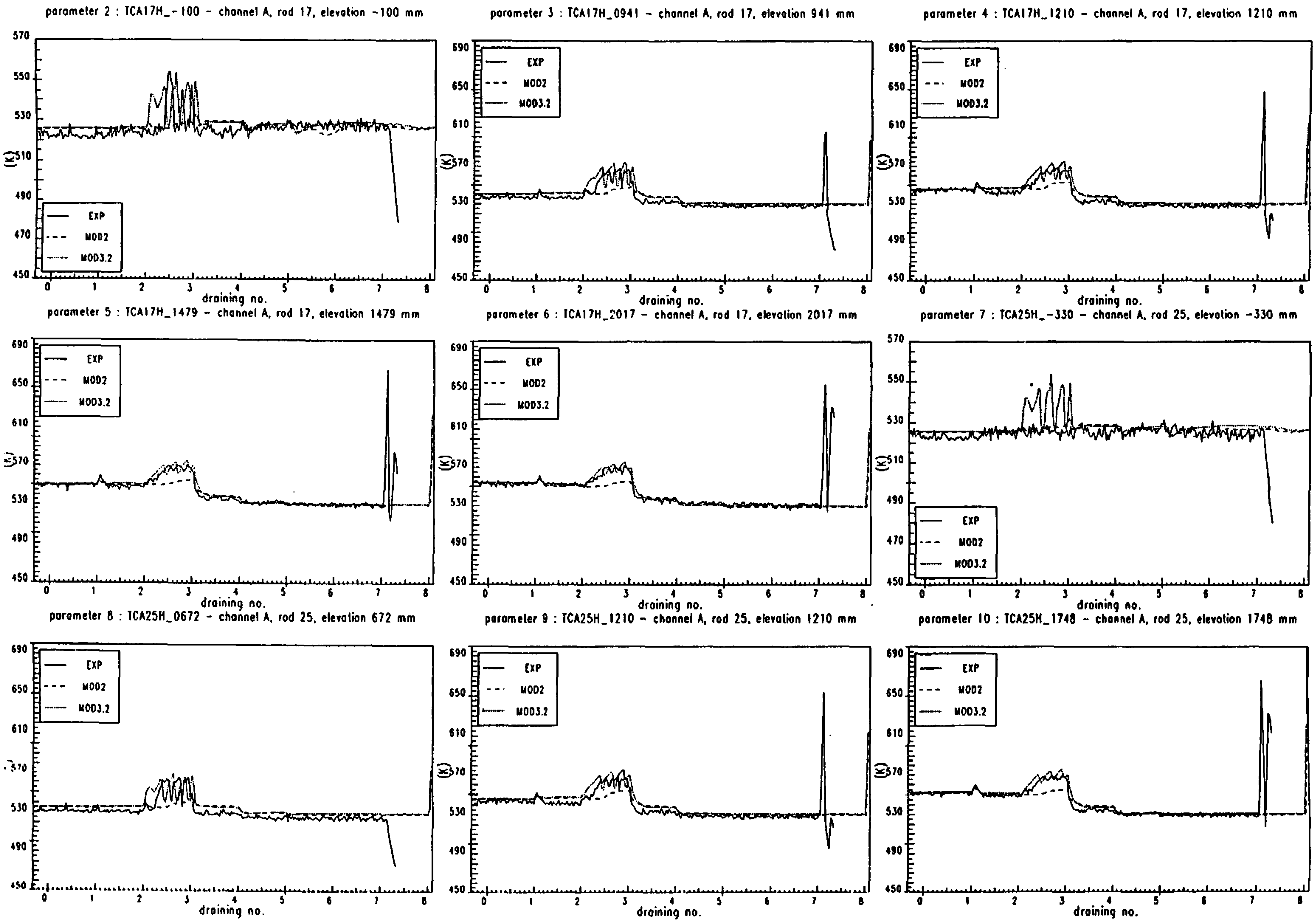
# ISP-33 Strip Input Deck
# and
# Complete Set of Comparison Plots
# (post-test results)

Parameters 2- 77: base set of requested parameters
Parameters 78-121: supplementing parameters
Parameters 122-150: parameters calculated but not measured

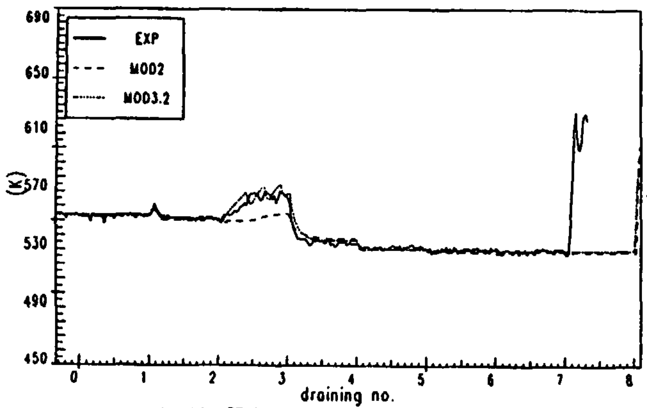
```
=isp-33 pactel - requested parameters strip
100 strip
103 0
*********************************************************************************
*                               strip requests                                  *
*********************************************************************************
*     alph.code   num.code     calc.id         description
******************************** main parameters *********************************
*
*   heat structure temperatures
1002  httemp      104100105    * tca17h_-100 - channel a, rod 17, elev. -100 mm
1003  httemp      106000407    * tca17h_0941 - channel a, rod 17, elev.  941 mm
1004  httemp      106000507    * tca17h_1210 - channel a, rod 17, elev. 1210 mm
1005  httemp      106000607    * tca17h_1479 - channel a, rod 17, elev. 1479 mm
1006  httemp      106000807    * tca17h_2017 - channel a, rod 17, elev. 2017 mm
1007  httemp      104100105    * tca25h_-330 - channel a, rod 25, elev. -330 mm
1008  httemp      106000307    * tca25h_0672 - channel a, rod 25, elev.  672 mm
1009  httemp      106000507    * tca25h_1210 - channel a, rod 25, elev. 1210 mm
1010  httemp      106000707    * tca25h_1748 - channel a, rod 25, elev. 1748 mm
1011  httemp      106000907    * tca25h_2286 - channel a, rod 25, elev. 2286 mm
*   temperatures
1012  tempf       107030000    * tfuph_8340  - upper plenum, elevation  8340 mm
1013  tempf       108030000    * tfuph_11440 - upper plenum, elevation 11440 mm
1014  tempf       301110000    * tfhl1h_9600 - hot leg 1, elevation 9600 mm
1015  tempf       351010000    * tfcl1h_9600 - cold leg 1, elevation 9600 mm
1016  tempf       401110000    * tfhl2h_9600 - hot leg 2, elevation 9600 mm
1017  tempf       451010000    * tfcl2h_9600 - cold leg 2, elevation 9600 mm
1018  tempf       501110000    * tfhl3h_9600 - hot leg 3, elevation 9600 mm
1019  tempf       551010000    * tfcl3h_9600 - cold leg 3, elevation 9600 mm
1020  tempf       325010000    * tfsg1pr26a  - sg 1 prim, tube 26, location a
1021  tempf       325030000    * tfsg1pr26b  - sg 1 prim, tube 26, location b
1022  tempf       325050000    * tfsg1pr26c  - sg 1 prim, tube 26, location c
1023  tempf       601010000    * tfsg1se26b  - sg 1 sec, tube 26, location b
1024  tempf       602010000    * tfsg1se23b  - sg 1 sec, tube 23, location b
1025  tempf       603010000    * tfsg1se11b  - sg 1 sec, tube 11, location b
1026  tempf       425010000    * tfsg2pr26a  - sg 2 prim, tube 26, location a
1027  tempf       425030000    * tfsg2pr26b  - sg 2 prim, tube 26, location b
1028  tempf       425050000    * tfsg2pr26c  - sg 2 prim, tube 26, location c
1029  tempf       701010000    * tfsg2se26b  - sg 2 sec, tube 26, location b
1030  tempf       702010000    * tfsg2se23b  - sg 2 sec, tube 23, location b
1031  tempf       703010000    * tfsg2se11b  - sg 2 sec, tube 11, location b
1032  tempf       525010000    * tfsg3pr26a  - sg 3 prim, tube 26, location a
1033  tempf       525030000    * tfsg3pr26b  - sg 3 prim, tube 26, location b
1034  tempf       525050000    * tfsg3pr26c  - sg 3 prim, tube 26, location c
1035  tempf       801010000    * tfsg3se26b  - sg 3 sec, tube 26, location b
1036  tempf       802010000    * tfsg3se23b  - sg 3 sec, tube 23, location b
1037  tempf       803010000    * tfsg3se11b  - sg 3 sec, tube 11, location b
1038  tempf       102020000    * tfdch_4620  - downcomer, elevation 4620 mm
1039  tempf       103020000    * tflph_0070  - lower plenum, elevation 0070 mm
1040  tempf       104010000    * tfcoh_2800  - core/lp, elevation 2800 mm
1041  tempf       107010000    * tfach_6150  - core/up, elevation 6150 mm
*   pressures
1042  p           202100000    * p02pz       - pressure in pressurizer
1043  p           606010000    * p04sg1      - secondary pressure, sg 1
*   differential pressures
1044  cntrlvar          144    * dp18up      - diff. pressure up
1045  cntrlvar          145    * dp17upco    - diff. pressure up-co
1046  cntrlvar          146    * dp19uplp    - diff. pressure up-lp
1047  cntrlvar          147    * dp16co      - diff. pressure core
1048  cntrlvar          148    * dp23dclp    - diff. pressure dc-lp
1049  cntrlvar          149    * dp24pz      - diff. press. pressurizer
```

```
1050  cntrlvar         150    * dp28uphl1    - dp 1, hot leg 1
1051  cntrlvar         151    * dp25hl1      - dp 2, hot leg 1
1052  cntrlvar         152    * dp30hl1cl1   - dp over sg 1
1053  cntrlvar         153    * dp26cl1      - dp 1, cold leg 1
1054  cntrlvar         154    * dp29dccl1    - dp 2, cold leg 1
1055  cntrlvar         155    * dp33uphl2    - dp 1, hot leg 2
1056  cntrlvar         156    * dp34hl2      - dp 2, hot leg 2
1057  cntrlvar         157    * dp32hl2cl2   - dp over sg 2
1058  cntrlvar         158    * dp35cl2      - dp 1, cold leg 1
1059  cntrlvar         159    * dp36dccl2    - dp 2, cold leg 2
1060  cntrlvar         160    * dp39uphl3    - dp 1, hot leg 3
1061  cntrlvar         161    * dp40hl3      - dp 2, hot leg 3
1062  cntrlvar         162    * dp38hl3cl3   - dp over sg 3
1063  cntrlvar         163    * dp41cl3      - dp 1, cold leg 1
1064  cntrlvar         164    * dp42dccl3    - dp 2, cold leg 3
*   mass flows
1065  mflowj     351010000    * fcl1         - mass flow, cold leg 1
1066  mflowj     451010000    * fcl2         - mass flow, cold leg 2
1067  mflowj     551010000    * fcl3         - mass flow, cold leg 3
1068  mflowj     102010000    * fdc          - mass flow, downcomer
1069  mflowj     131000000    * flp          - outlet mass flow
*   heating power
1070  cntrlvar         100    * e_total      - total core power
*   levels
1071  cntrlvar         171    * lepr  ????   - primary level, from d19
1072  cntrlvar         172    * lepz  ????   - pressurizer level, from d24
1073  cntrlvar         173    * ledc  ????   - downcomer level, from d23
1074  cntrlvar          74    * leup  ????   - upper plenum level, from d18
1075  cntrlvar         175    * lesg1 ????   - sg 1 secondary level, from d27
1076  cntrlvar         176    * lesg2 ????   - sg 2 secondary level, from d31
1077  cntrlvar         177    * lesg3 ????   - sg 3 secondary level, from d37
*
************************** supplementing parameters **************************
*
*   temperatures
1078  tempf      301070000    * tfhl1h_6820 - hot leg 1, elevation 6820 mm
1079  tempf      301010000    * tfhl1h_8750 - hot leg 1, elevation 8750 mm
1080  tempf      351140000    * tfcl1h_7350 - cold leg 1, elevation 7350 mm
1081  tempf      351050000    * tfcl1h_6820 - cold leg 1, elevation 6820 mm
1082  tempf      401070000    * tfhl2h_6820 - hot leg 2, elevation 6820 mm
1083  tempf      401010000    * tfhl2h_8750 - hot leg 2, elevation 8750 mm
1084  tempf      451140000    * tfcl2h_7350 - cold leg 2, elevation 7350 mm
1085  tempf      451050000    * tfcl2h_6820 - cold leg 2, elevation 6820 mm
1086  tempf      501070000    * tfhl3h_6820 - hot leg 3, elevation 6820 mm
1087  tempf      501010000    * tfhl3h_8750 - hot leg 3, elevation 8750 mm
1088  tempf      551140000    * tfcl3h_7350 - cold leg 3, elevation 7350 mm
1089  tempf      551050000    * tfcl3h_6820 - cold leg 3, elevation 6820 mm
1090  tempf      326010000    * tfsg1pr23a   - sg 1 prim, tube 23, location a
1091  tempf      326030000    * tfsg1pr23b   - sg 1 prim, tube 23, location b
1092  tempf      326050000    * tfsg1pr23c   - sg 1 prim, tube 23, location c
1093  tempf      426010000    * tfsg2pr23a   - sg 2 prim, tube 23, location a
1094  tempf      426030000    * tfsg2pr23b   - sg 2 prim, tube 23, location b
1095  tempf      426050000    * tfsg2pr23c   - sg 2 prim, tube 23, location c
1096  tempf      526010000    * tfsg3pr23a   - sg 3 prim, tube 23, location a
1097  tempf      526030000    * tfsg3pr23b   - sg 3 prim, tube 23, location b
1098  tempf      526050000    * tfsg3pr23c   - sg 3 prim, tube 23, location c
1099  tempf      111010000    * tfdch_7900   - downcomer, elevation 7900 mm
1100  tempf      130010000    * tfdch_1700   - downcomer, elevation 1700 mm
1101  tempf      103030000    * tflph_1700   - lower plenum, elevation 1700 mm
1102  tempf      107010000    * tfbch_6150   - core/up, elevation 6150 mm
1103  tempf      107010000    * tfcch_6150   - core/up, elevation 6150 mm
```

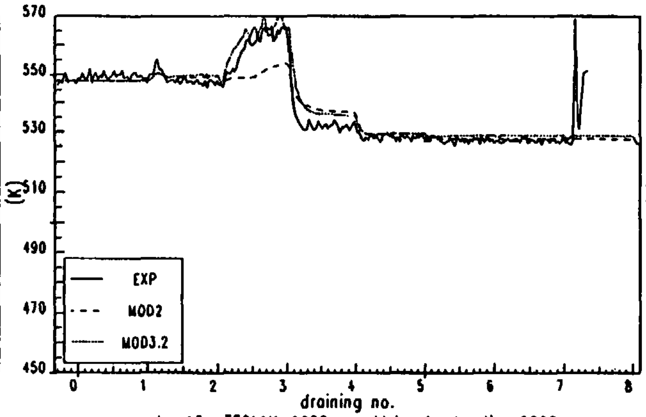
```
1104  tempf       202050000    * tfpzh_12240 - pressurizer, elevation 12240 mm
1105  tempf       202100000    * tfpzh_16090 - pressurizer, elevation 16090 mm
1106  tempf       651010000    * tfsg1fw     - sg 1 feed water temp
1107  tempf       751010000    * tfsg2fw     - sg 2 feed water temp
1108  tempf       851010000    * tfsg3fw     - sg 3 feed water temp
1109  sattemp     108030000    * sat_temp    - upper plenum sat temp
*   pressures
1110  p           108030000    * p01up       - pressure in upper plenum
1111  p           706010000    * p05sg2      - secondary pressure, sg 2
1112  p           806010000    * p06sg3      - secondary pressure, sg 3
*   differential pressures
1113  cntrlvar          165    * dp27sg1s    - sg 1, secondary dp
1114  cntrlvar          166    * dp31sg2s    - sg 2, secondary dp
1115  cntrlvar          167    * dp37sg3s    - sg 3, secondary dp
*   mass flows
1116  mflowj      652000000    * fih01       - sg 1 feed water mass flow
1117  mflowj      752000000    * fih02       - sg 2 feed water mass flow
1118  mflowj      852000000    * fih03       - sg 3 feed water mass flow
*   heating power
1119  cntrlvar          104    * eac         - core power, channel a
1120  cntrlvar          104    * ebc         - core power, channel b
1121  cntrlvar          104    * ecc         - core power, channel c
*
******************** parameters calculated but not measured ********************
*
*   coolant mass
1122  cntrlvar          122    * primas      - primary mass
1123  cntrlvar          111    * vessmass    - vessel mass
1124  cntrlvar          112    * przmass     - pressurizer mass
1125  cntrlvar          113    * hotl1mass   - hot leg 1 mass
1126  cntrlvar          114    * hotl2mass   - hot leg 2 mass
1127  cntrlvar          115    * hotl3mass   - hot leg 3 mass
1128  cntrlvar          116    * sgtube1mass - sg 1 tube mass
1129  cntrlvar          117    * sgtube2mass - sg 2 tube mass
1130  cntrlvar          118    * sgtube3mass - sg 3 tube mass
1131  cntrlvar          119    * coldl1mass  - cold leg 1 mass
1132  cntrlvar          120    * coldl2mass  - cold leg 2 mass
1133  cntrlvar          121    * coldl3mass  - cold leg 3 mass
1134  cntrlvar          131    * sgsec1mass  - sg 1 mass
1135  cntrlvar          132    * sgsec2mass  - sg 2 mass
1136  cntrlvar          133    * sgsec3mass  - sg 3 mass
*   heat fluxes
1137  cntrlvar          102    * corehflux  - heat from core
1138  cntrlvar          304    * sgen1hflux - sg 1 heat flux
1139  cntrlvar          305    * sgen2hflux - sg 2 heat flux
1140  cntrlvar          306    * sgen3hflux - sg 3 heat flux
*   heat losses
1141  cntrlvar          916    * vesshloss  - vessel heat loss
1142  cntrlvar          917    * loop1hloss - loop 1 heat loss
1143  cntrlvar          918    * loop2hloss - loop 2 heat loss
1144  cntrlvar          919    * loop3hloss - loop 3 heat loss
1145  cntrlvar          920    * przhloss   - pressurizer heat loss
1146  cntrlvar          907    * sec1hloss  - sg 1 sec. heat loss
1147  cntrlvar          910    * sec3hloss  - sg 2 sec. heat loss
1148  cntrlvar          913    * sec2hloss  - sg 3 sec. heat loss
*   mass flow
1149  mflowj      904000000    * steamout   - steam flow out
*   level
1150  cntrlvar           78    * corelevel  - core level ????
.
```


parameter 2 : TCA17H_-100 - channel A, rod 17, elevation -100 mm
parameter 3 : TCA17H_0941 - channel A, rod 17, elevation 941 mm
parameter 4 : TCA17H_1210 - channel A, rod 17, elevation 1210 mm
parameter 5 : TCA17H_1479 - channel A, rod 17, elevation 1479 mm
parameter 6 : TCA17H_2017 - channel A, rod 17, elevation 2017 mm
parameter 7 : TCA25H_-330 - channel A, rod 25, elevation -330 mm
parameter 8 : TCA25H_0672 - channel A, rod 25, elevation 672 mm
parameter 9 : TCA25H_1210 - channel A, rod 25, elevation 1210 mm
parameter 10 : TCA25H_1748 - channel A, rod 25, elevation 1748 mm
EXP
MOD2
MOD3.2
(K)
draining no.

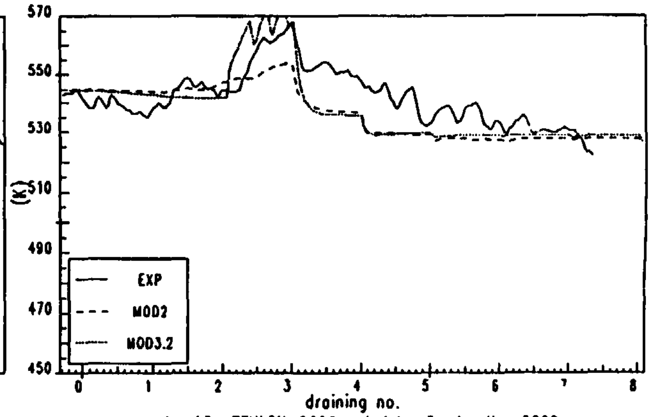
parameter 11 : TCA25H_2286 - channel A, rod 25, elevation 2286 mm



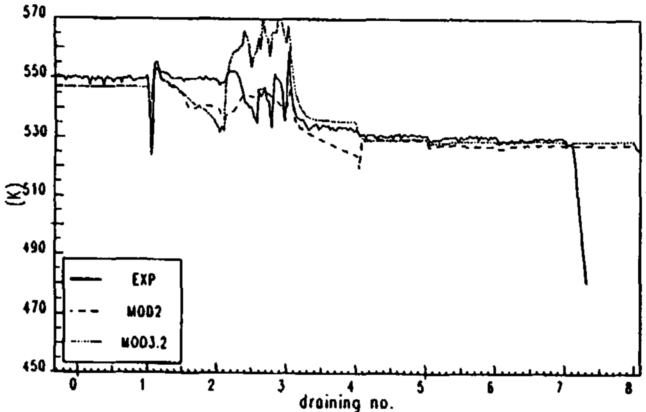

parameter 12 : TFUPH_8340 - upper plenum, elevation 8340 mm



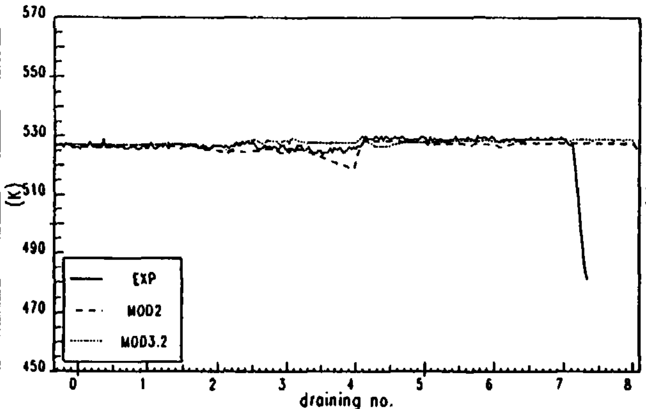

parameter 13 : TFUPH_11440 - upper plenum, elevation 11440 mm



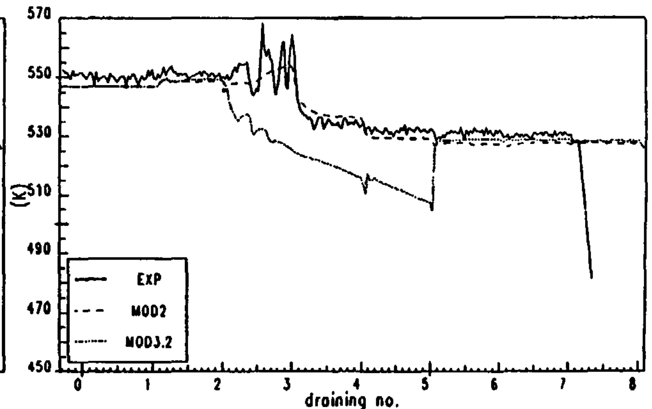

parameter 14 : TFHL1H_9600 - hot leg 1, elevation 9600 mm



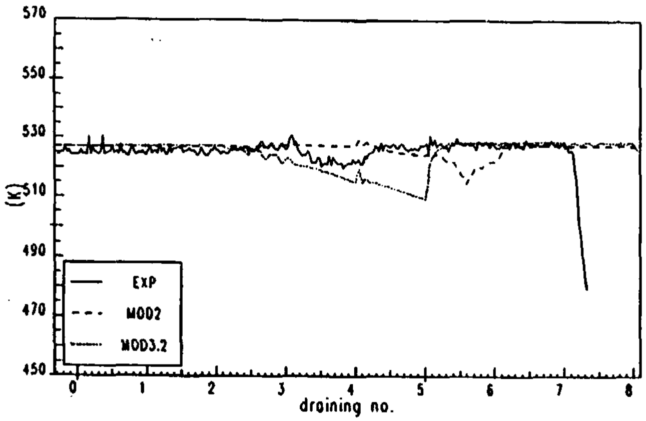

parameter 15 : TFCL1H_9600 - cold leg 1, elevation 9600 mm



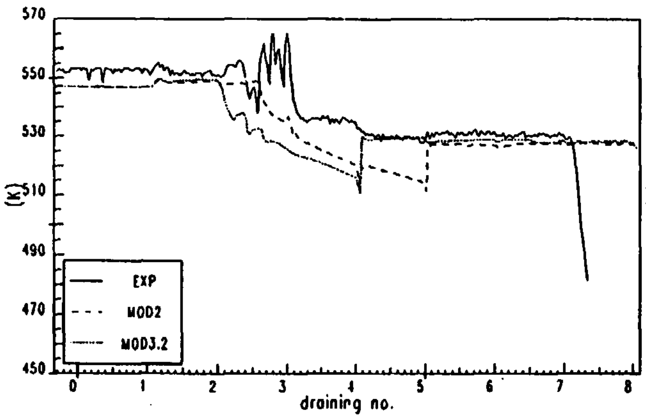

parameter 16 : TFHL2H_9600 - hot leg 2, elevation 9600 mm



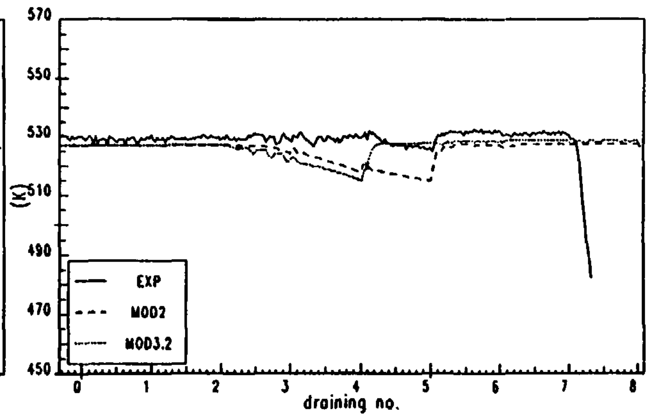

parameter 17 : TFCL2H_9600 - cold leg 2, elevation 9600 mm

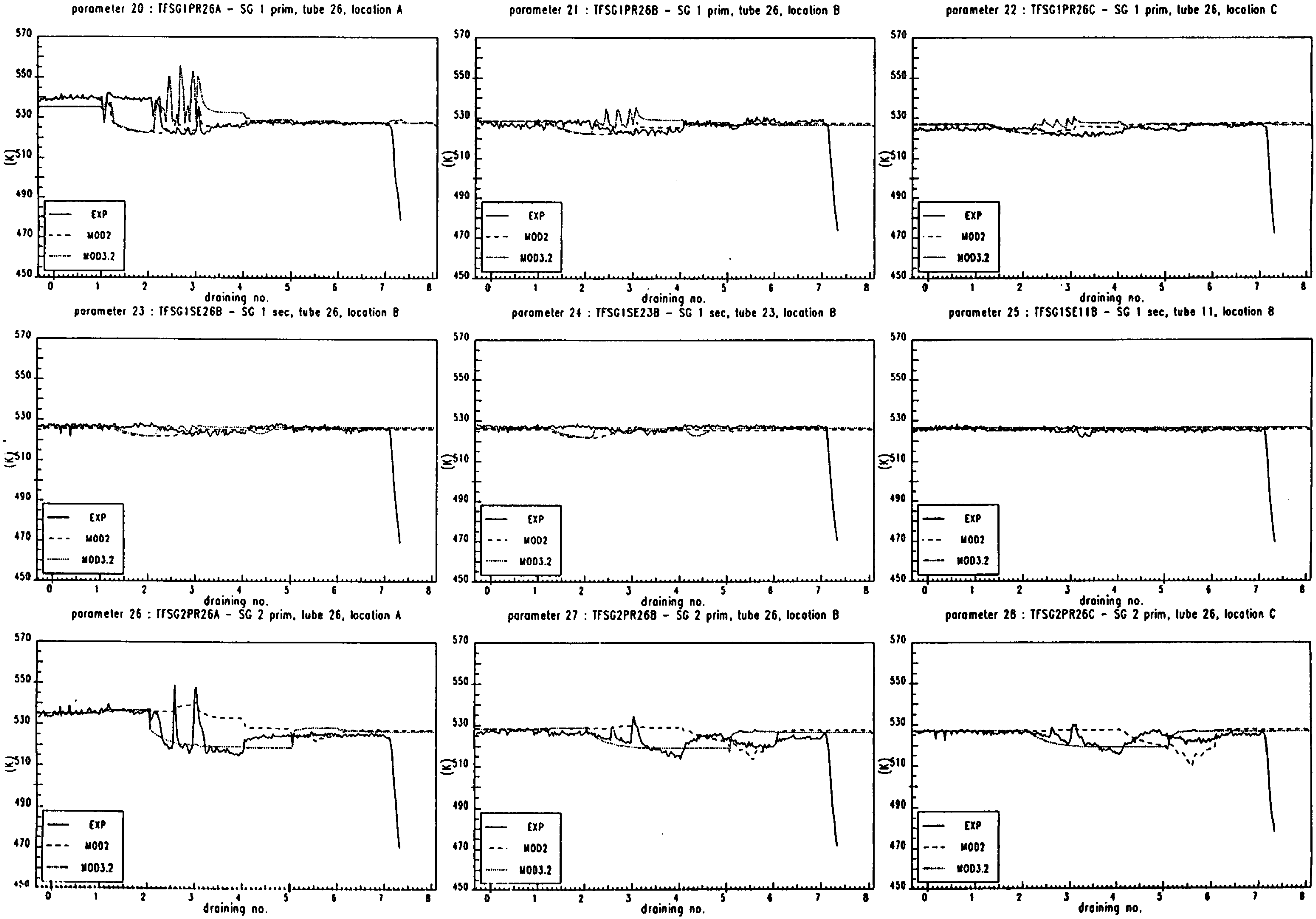



parameter 18 : TFHL3H_9600 - hot leg 3, elevation 9600 mm

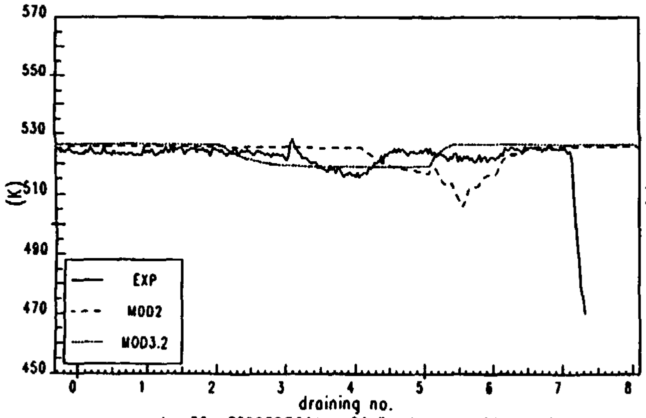



parameter 19 : TFCL3H_9600 - cold leg 3, elevation 9600 mm

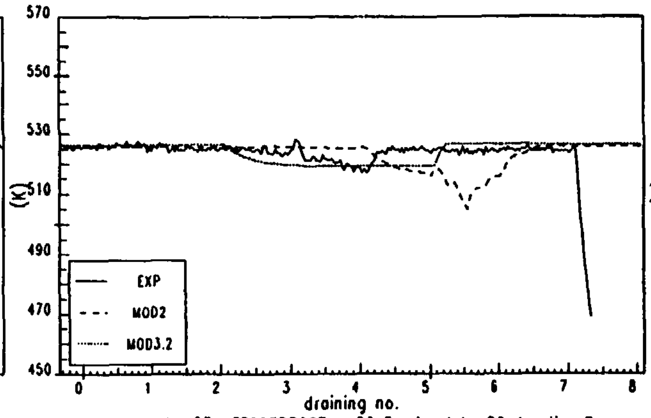



parameter 20 : TFSG1PR26A - SG 1 prim, tube 26, location A
parameter 21 : TFSG1PR26B - SG 1 prim, tube 26, location B
parameter 22 : TFSG1PR26C - SG 1 prim, tube 26, location C
parameter 23 : TFSG1SE26B - SG 1 sec, tube 26, location B
parameter 24 : TFSG1SE23B - SG 1 sec, tube 23, location B
parameter 25 : TFSG1SE11B - SG 1 sec, tube 11, location B
parameter 26 : TFSG2PR26A - SG 2 prim, tube 26, location A
parameter 27 : TFSG2PR26B - SG 2 prim, tube 26, location B
parameter 28 : TFSG2PR26C - SG 2 prim, tube 26, location C
(K)
draining no.
EXP
MOD2
MOD3.2

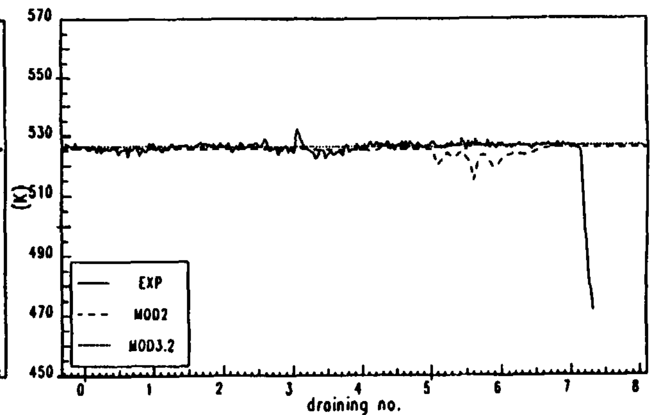
parameter 29 : TFSG2SE26B - SG 2 sec, tube 26, location B



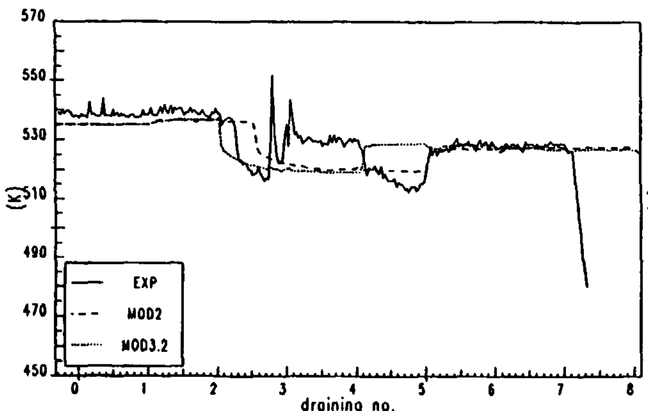

parameter 30 : TFSG2SE23B - SG 2 sec, tube 23, location B



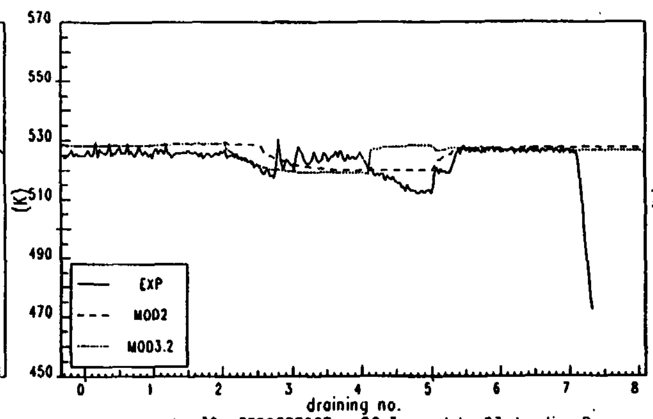

parameter 31 : TFSG2SE11B - SG 2 sec, tube 11, location B



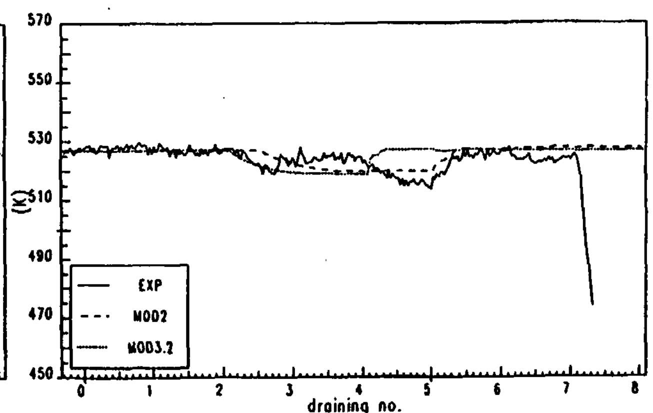

parameter 32 : TFSG3PR26A - SG 3 prim, tube 26, location A



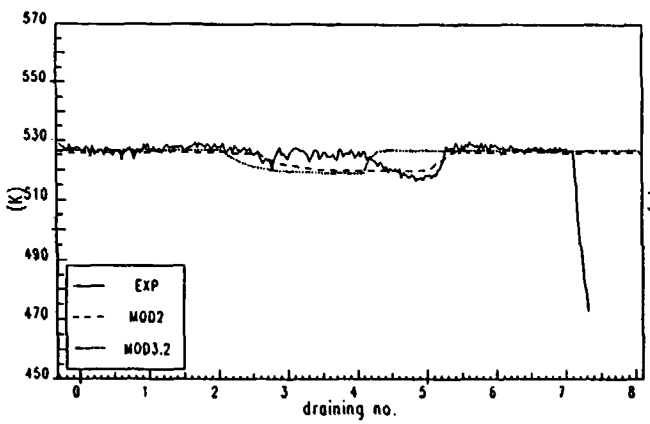

parameter 33 : TFSG3PR26B - SG 3 prim, tube 26, location B



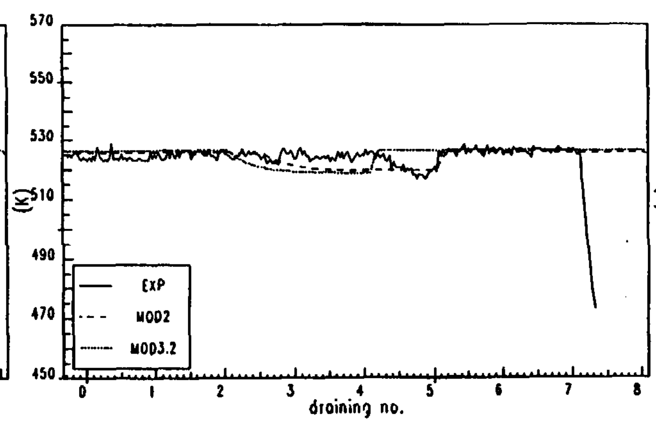

parameter 34 : TFSG3PR26C - SG 3 prim, tube 26, location C



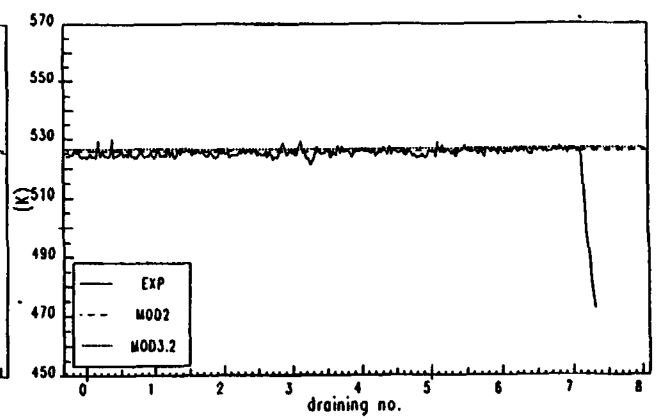

parameter 35 : TFSG3SE26B - SG 3 sec, tube 26, location B



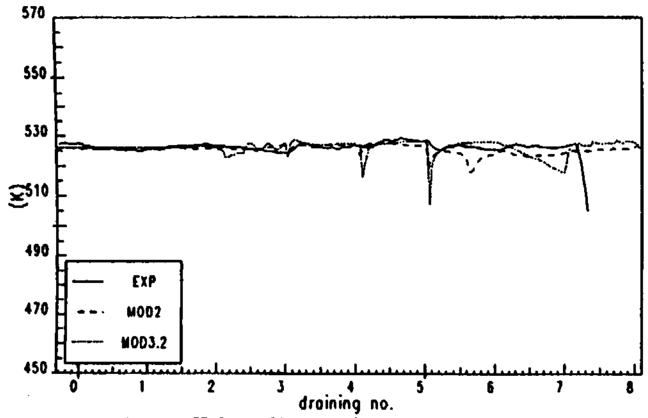

parameter 36 : TFSG3SE23B - SG 3 sec, tube 23, location B



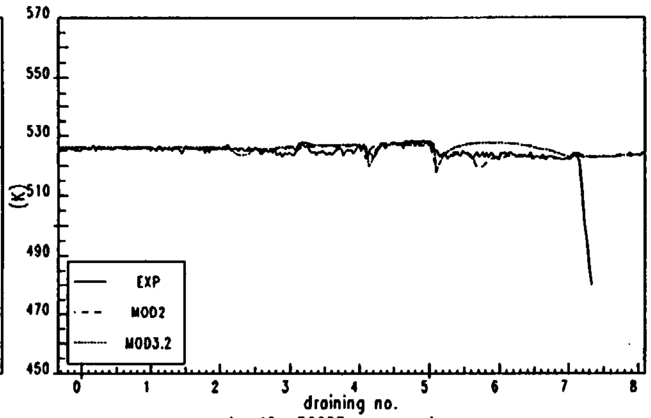

parameter 37 : TFSG3SE11B - SG 3 sec, tube 11, location B



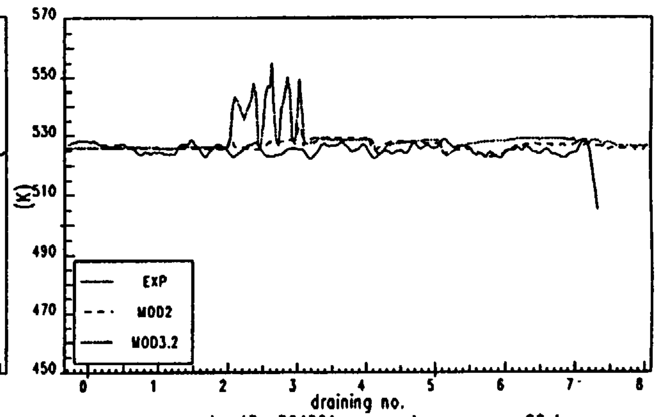
parameter 38 : TFDCH_4620 - downcomer, elevation 4620 mm



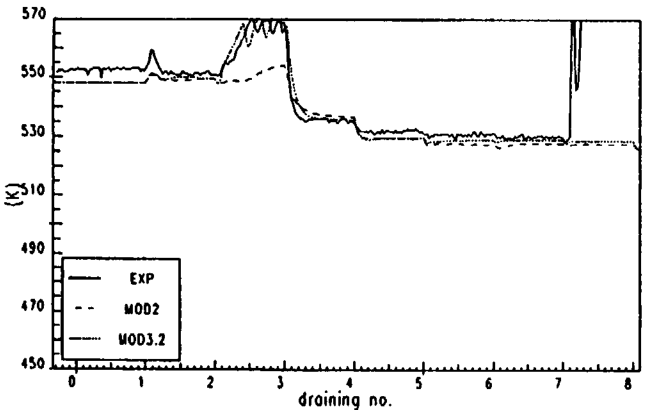

parameter 39 : TFLPH_0070 - lower plenum, elevation 0070 mm



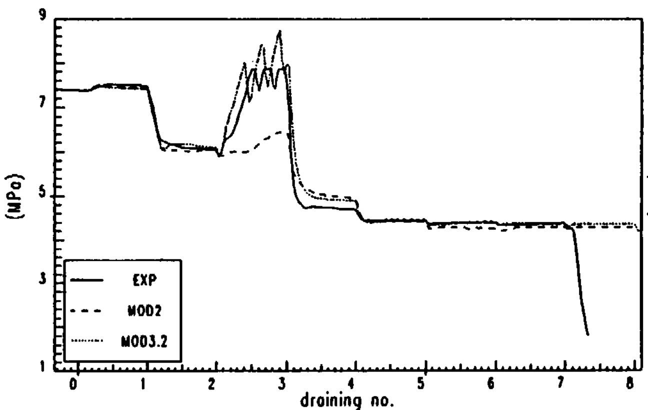

parameter 40 : TFCOH_2800 - core/lower plenum, elevation 2800 mm



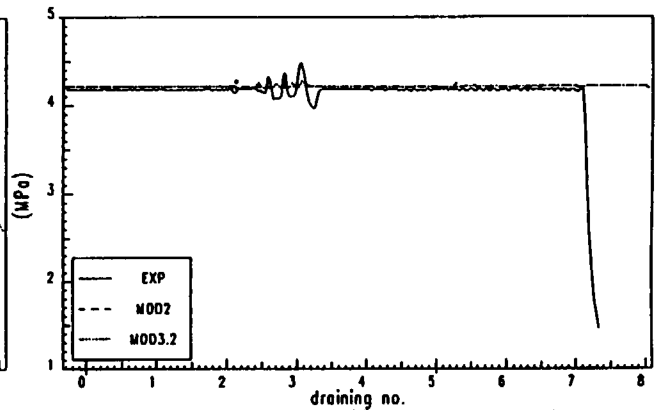

parameter 41 : TFACH_6150 - core/upper plenum, elevation 6150 mm



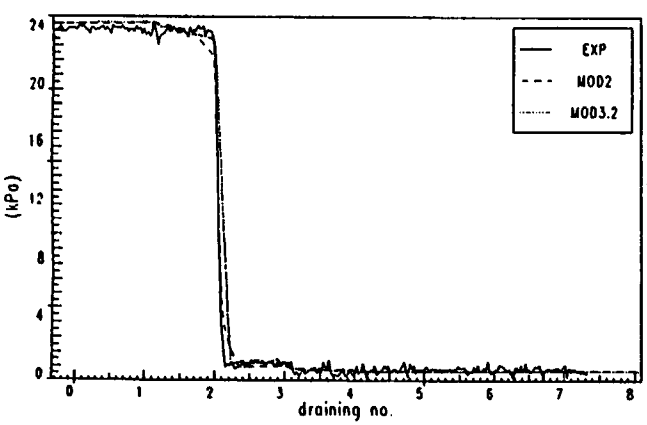

parameter 42 : P02PZ - pressurizer pressure



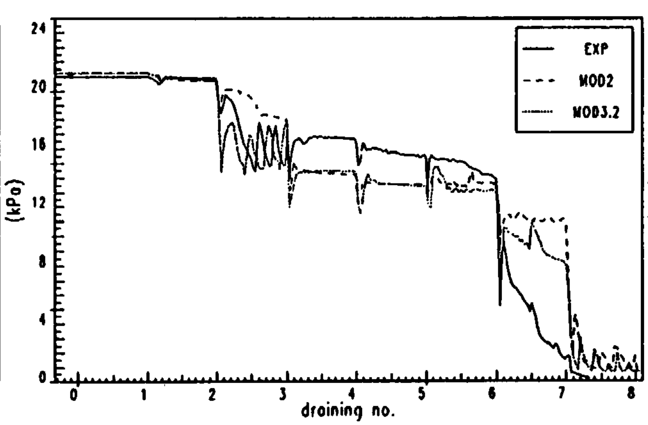

parameter 43 : P04SG1 - secondary pressure, SG 1



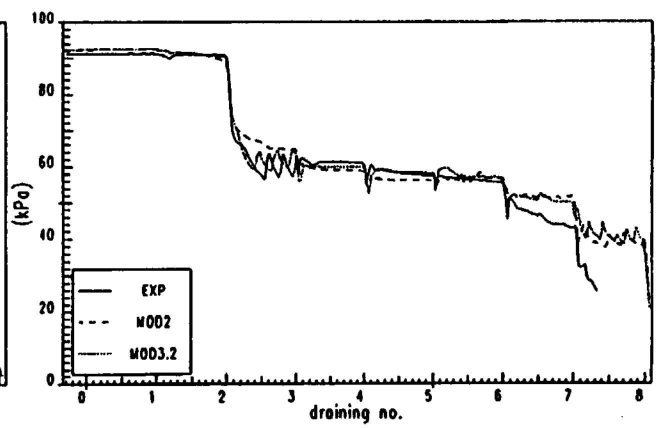

parameter 44 : DP18UP - DP upper plenum

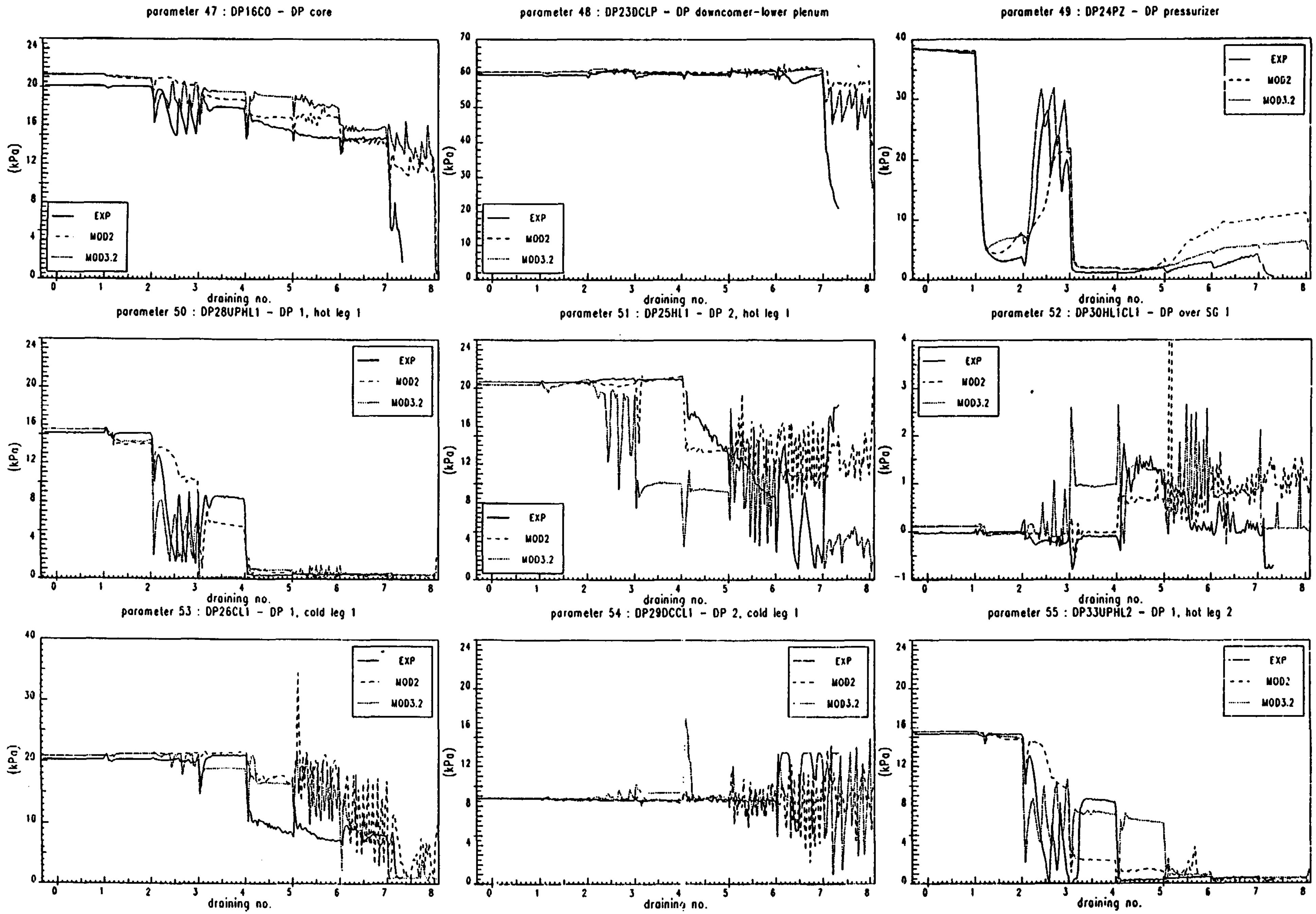



parameter 45 : DP17UPCO - DP upper plenum-core

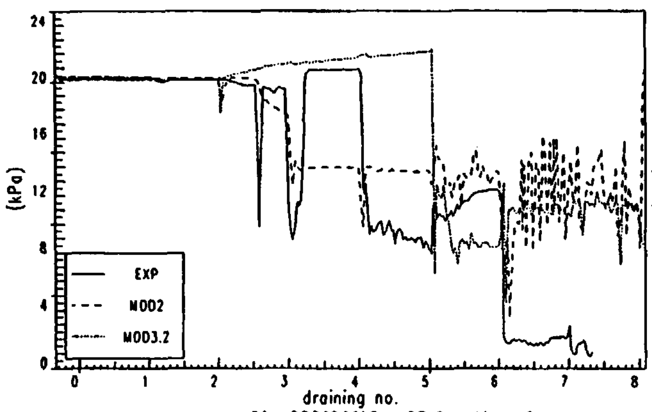



parameter 46 : DP19UPLP - DP upper plenum-lower plenum

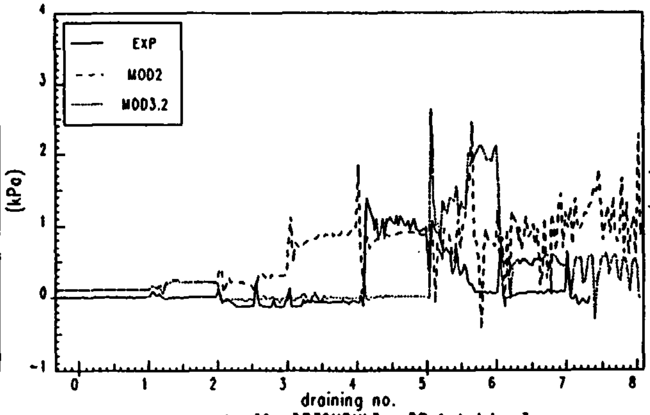



parameter 47 : DP16CO - DP core
parameter 48 : DP23DCLP - DP downcomer-lower plenum
parameter 49 : DP24PZ - DP pressurizer
parameter 50 : DP28UPHL1 - DP 1, hot leg 1
parameter 51 : DP25HL1 - DP 2, hot leg 1
parameter 52 : DP30HL1CL1 - DP over SG 1
parameter 53 : DP26CL1 - DP 1, cold leg 1
parameter 54 : DP29DCCL1 - DP 2, cold leg 1
parameter 55 : DP33UPHL2 - DP 1, hot leg 2
(kPa)
draining no.
EXP
MOD2
MOD3.2

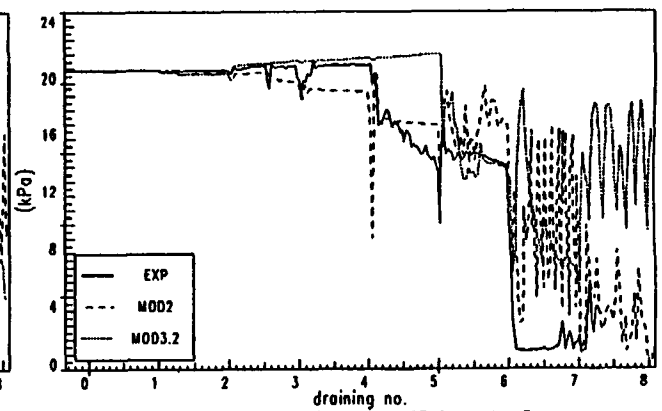
parameter 56 : DP34HL2 - DP 2, hot leg 2



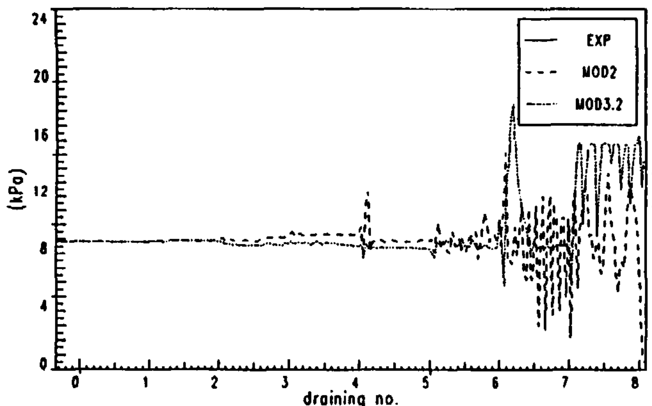

parameter 57 : DP32HL2CL2 - DP over SG 2



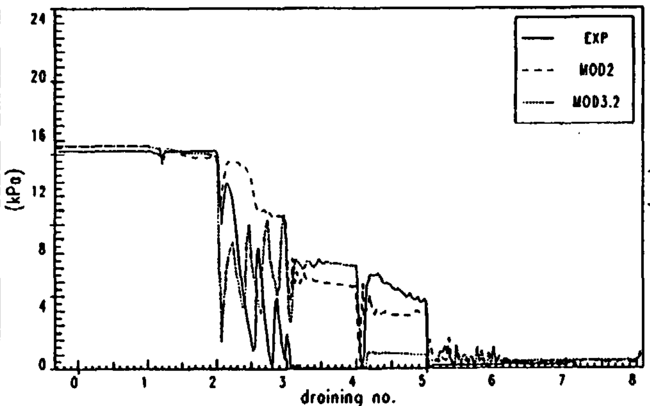

parameter 58 : DP35CL2 - DP 1, cold leg 2



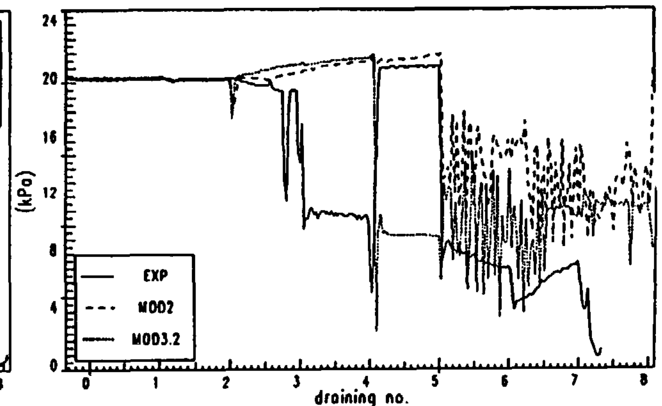

parameter 59 : DP36DCCL2 - DP 2, cold leg 2



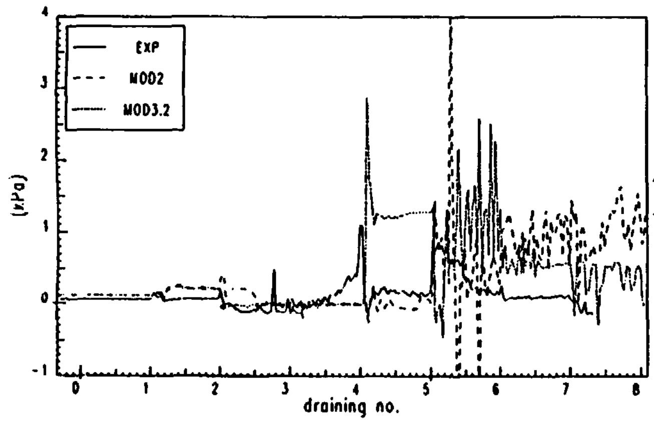

parameter 60 : DP39UPHL3 - DP 1, hot leg 3



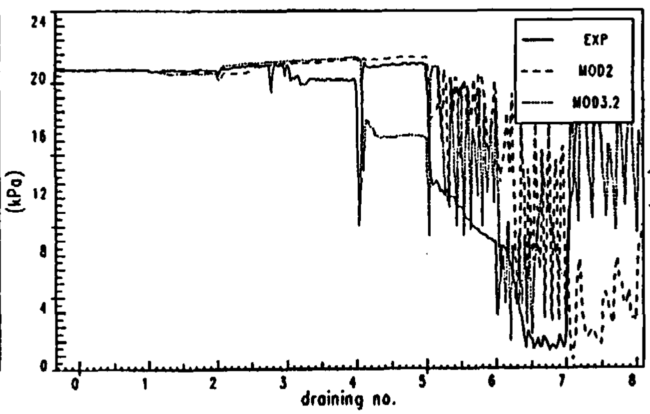

parameter 61 : DP40HL3 - DP 2, hot leg 3



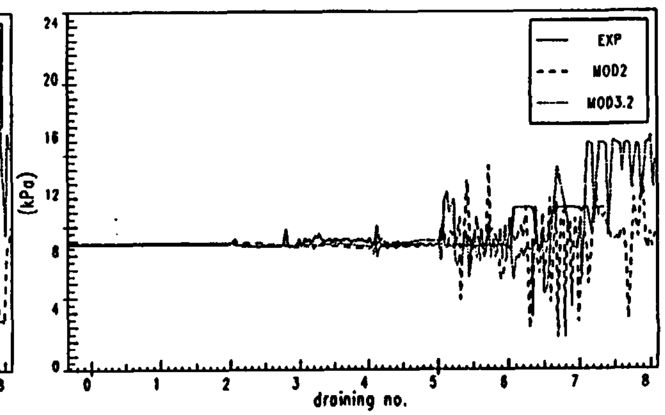

parameter 62 : DP38HL3CL3 - DP over SG 3



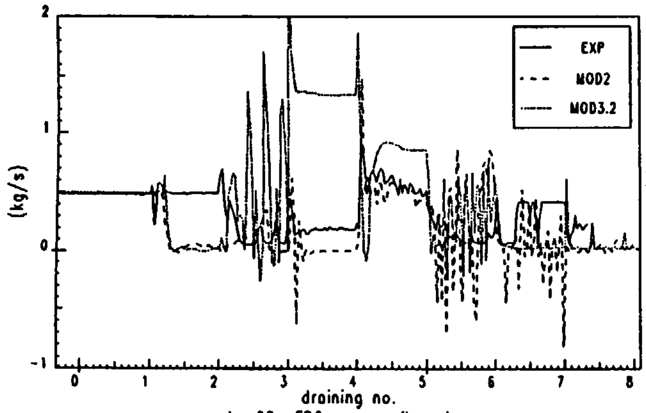

parameter 63 : DP41CL3 - DP 1, cold leg 3



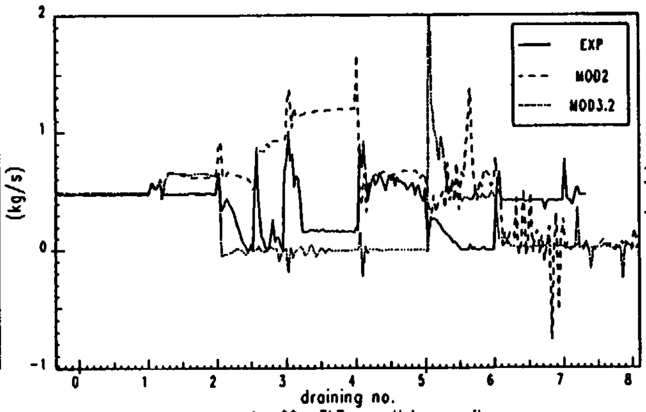

parameter 64 : DP42DCCL3 - DP 2, cold leg 3



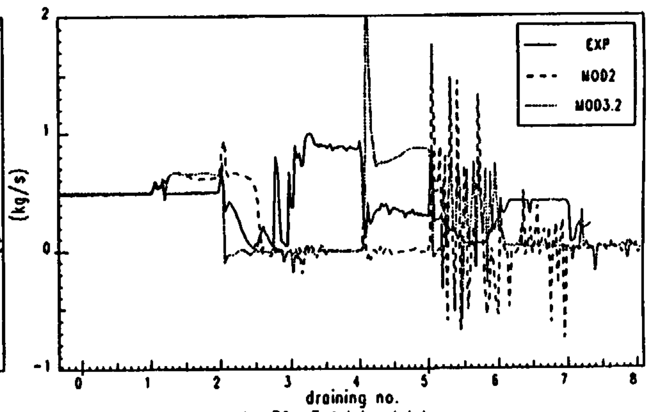
parameter 65 : FCL1 - mass flow, cold leg 1



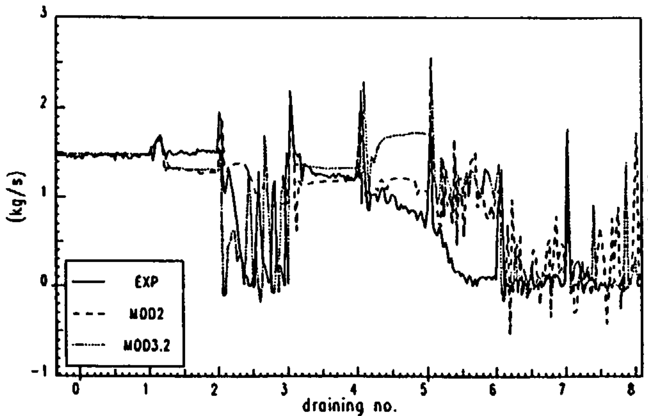

parameter 66 : FCL2 - mass flow, cold leg 2



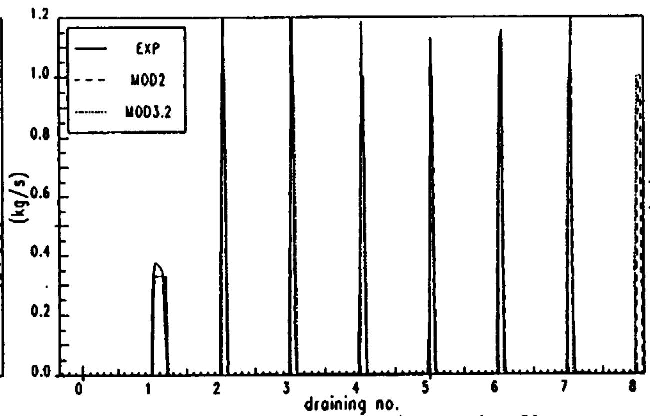

parameter 67 : FCL3 - mass flow, cold leg 3



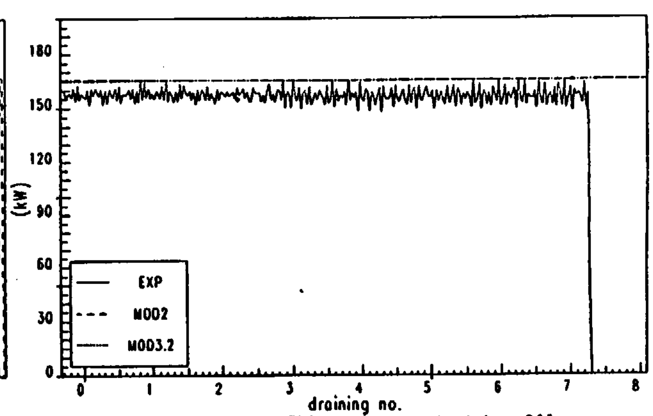

parameter 68 : FDC - mass flow, downcomer



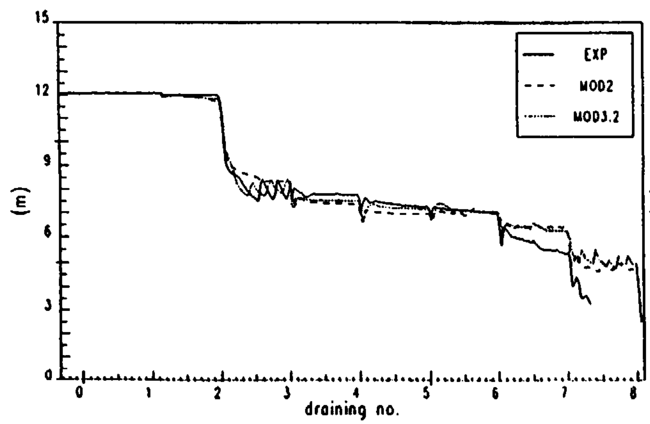

parameter 69 : FLP - outlet mass flow



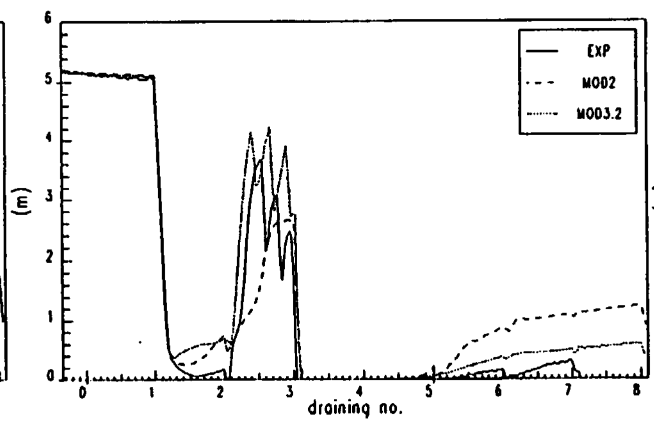

parameter 70 : E_total - total core power



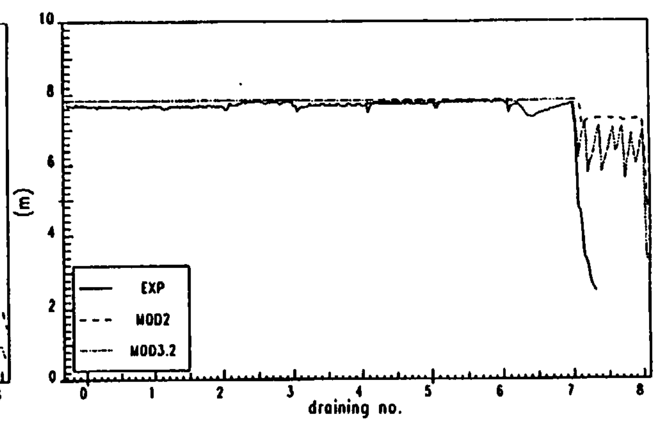

parameter 71 : LEPR - primary level, from D19



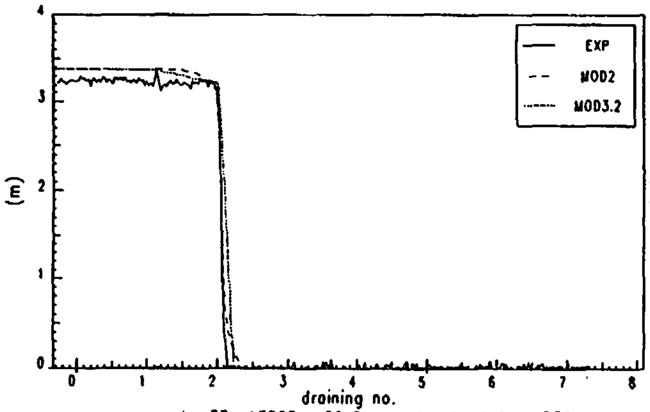

parameter 72 : LEPZ - pressurizer level, from D24



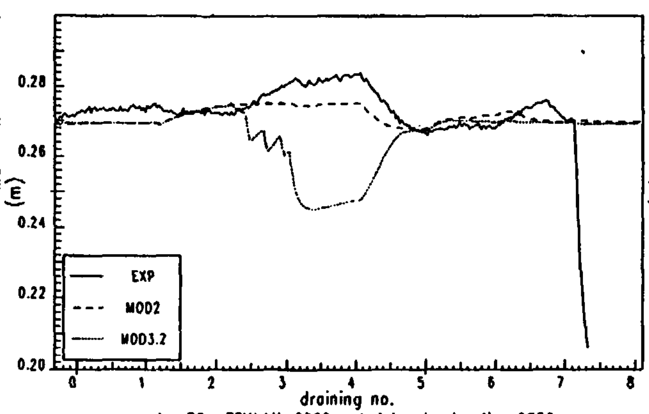

parameter 73 : LEDC - downcomer level, from D23



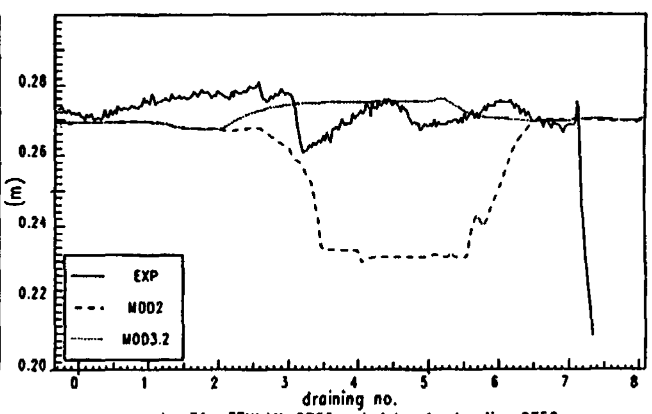
parameter 74 : LEUP - upper plenum level, from D18



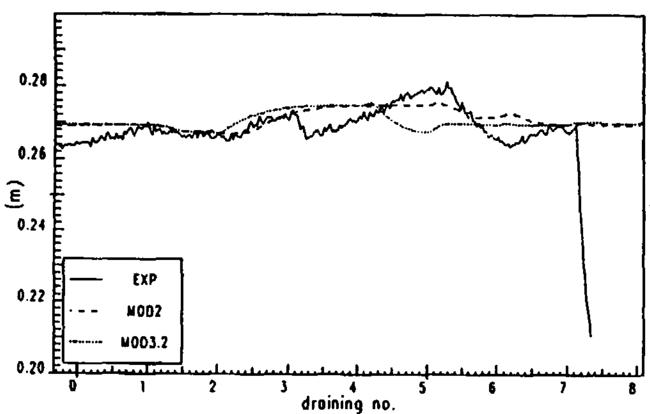

parameter 75 : LESG1 - SG 1 secondary level, from D27



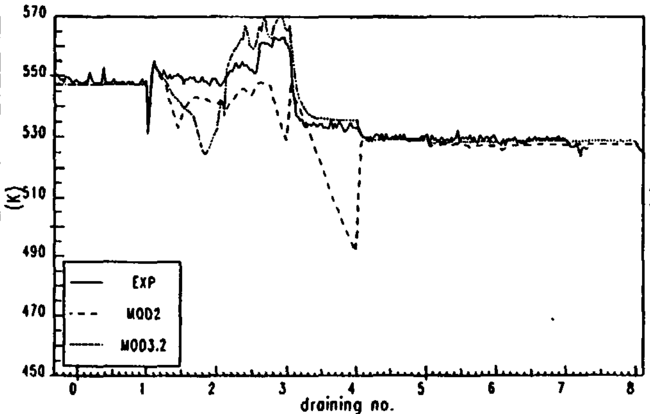

parameter 76 : LESG2 - SG 2 secondary level, from D31



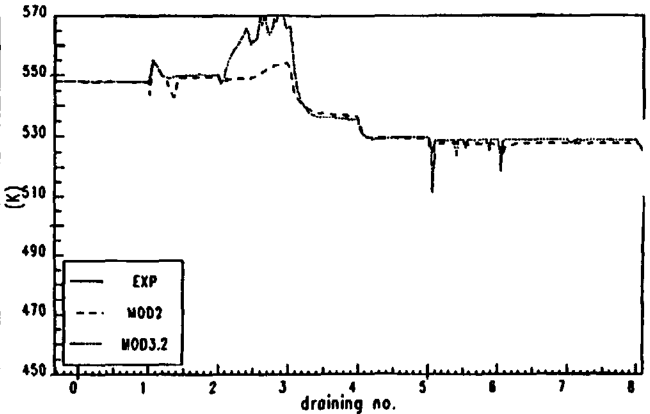

parameter 77 : LESG3 - SG 3 secondary level, from D37



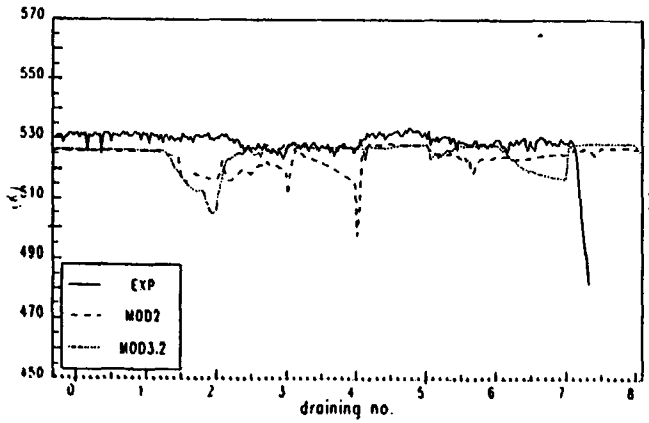

parameter 78 : TFHL1H_6820 - hot leg 1, elevation 6820 mm



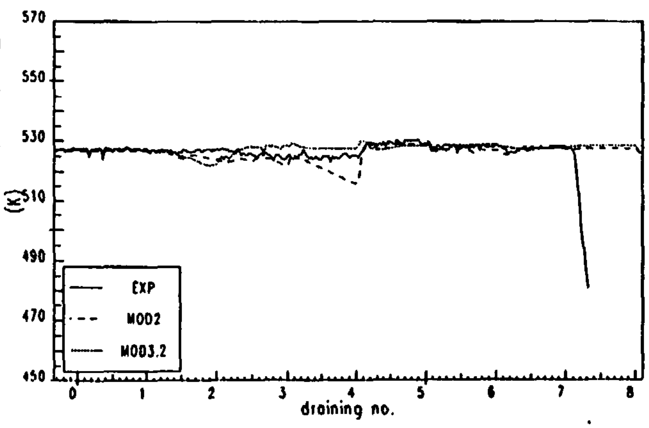

parameter 79 : TFHL1H_8750 - hot leg 1, elevation 8750 mm



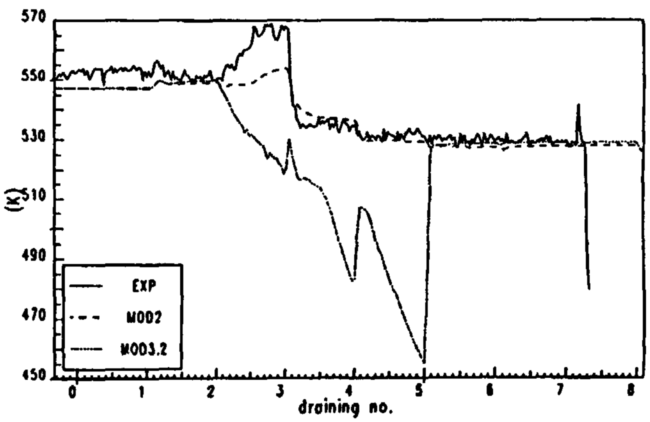

parameter 80 : TFCL1H_7350 - cold leg 1, elevation 7350 mm

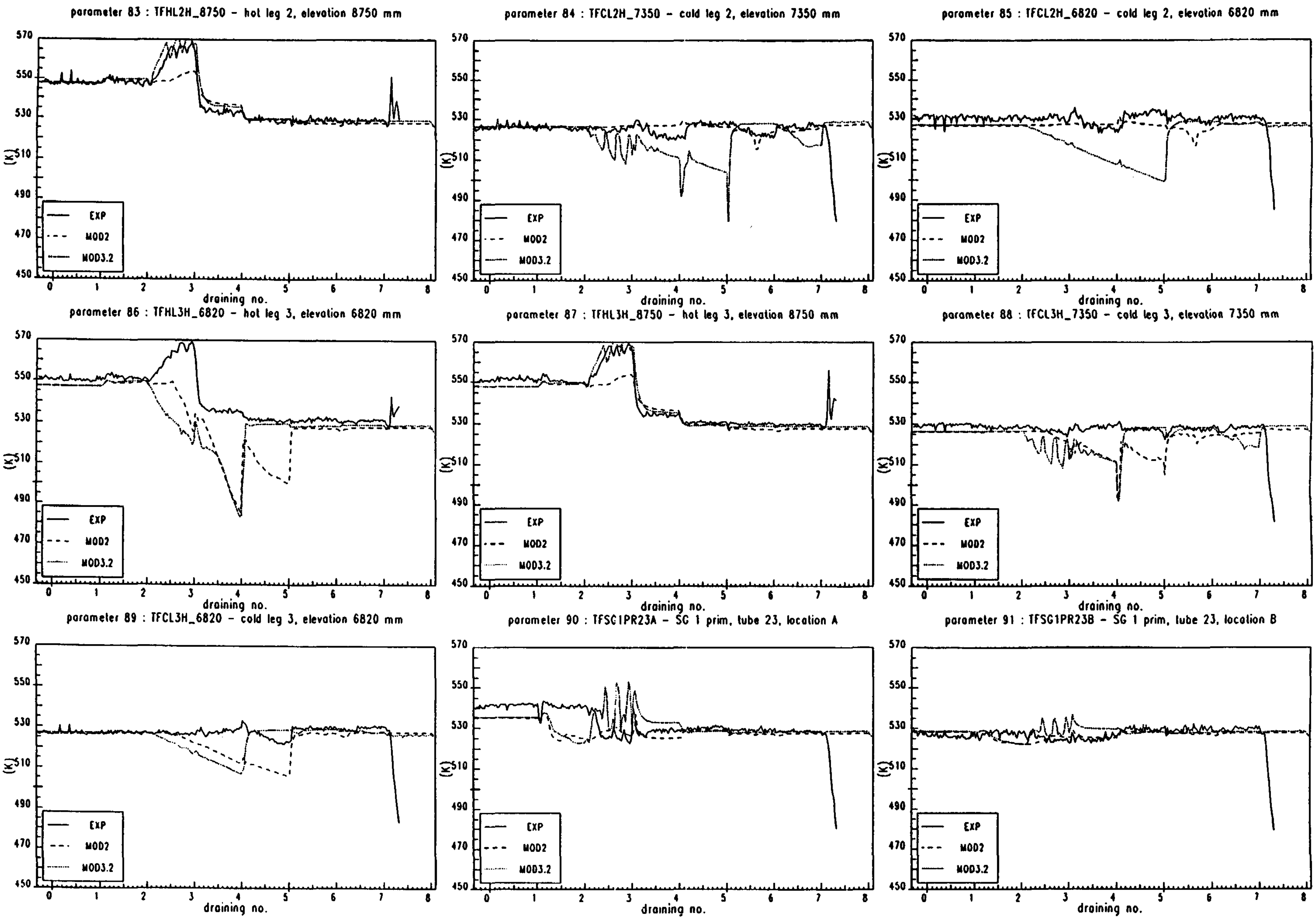



parameter 81 : TFCL1H_6820 - cold leg 1, elevation 6820 mm

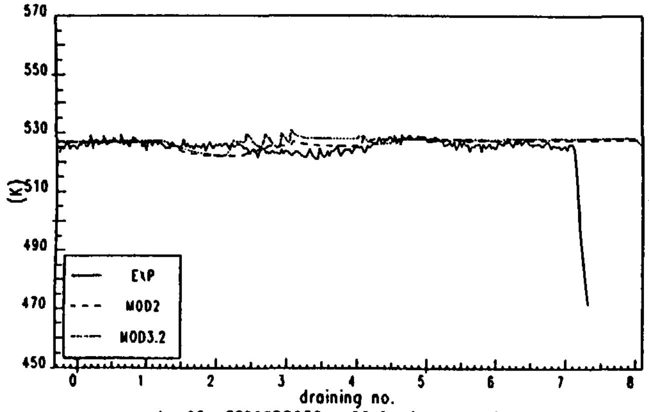



parameter 82 : TFHL2H_6820 - hot leg 2, elevation 6820 mm

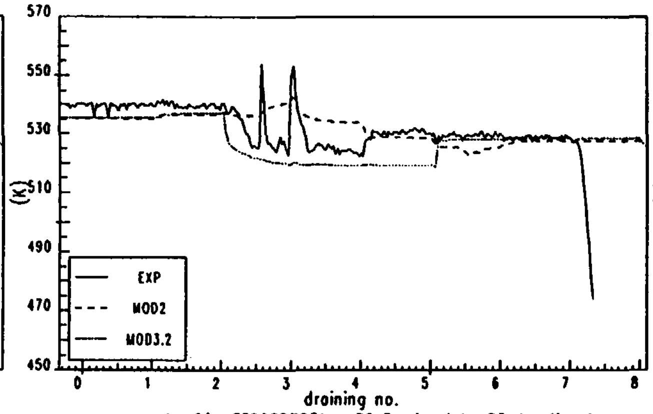



parameter 83 : TFHL2H_8750 - hot leg 2, elevation 8750 mm
parameter 84 : TFCL2H_7350 - cold leg 2, elevation 7350 mm
parameter 85 : TFCL2H_6820 - cold leg 2, elevation 6820 mm
parameter 86 : TFHL3H_6820 - hot leg 3, elevation 6820 mm
parameter 87 : TFHL3H_8750 - hot leg 3, elevation 8750 mm
parameter 88 : TFCL3H_7350 - cold leg 3, elevation 7350 mm
parameter 89 : TFCL3H_6820 - cold leg 3, elevation 6820 mm
parameter 90 : TFSG1PR23A - SG 1 prim, tube 23, location A
parameter 91 : TFSG1PR23B - SG 1 prim, tube 23, location B
(K)
draining no.
EXP
MOD2
MOD3.2

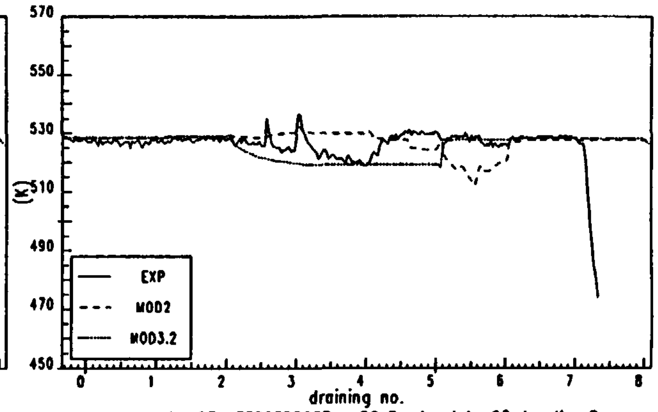
parameter 92 : TFSG1PR23C - SG 1 prim, tube 23, location C



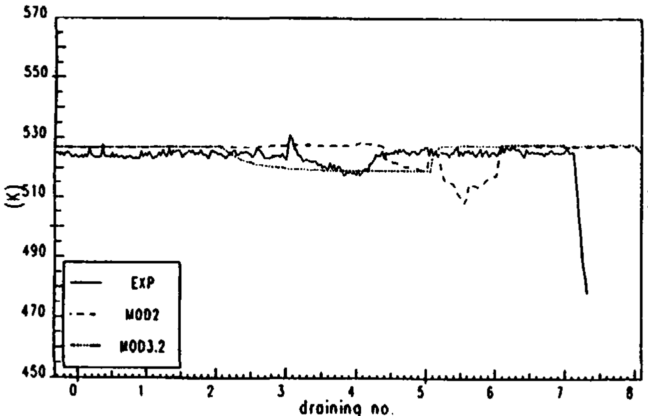

parameter 93 : TFSG2PR23A - SG 2 prim, tube 23, location A



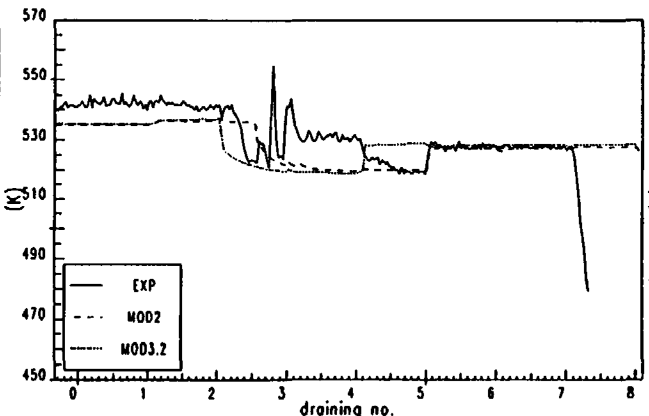

parameter 94 : TFSG2PR23B - SG 2 prim, tube 23, location B



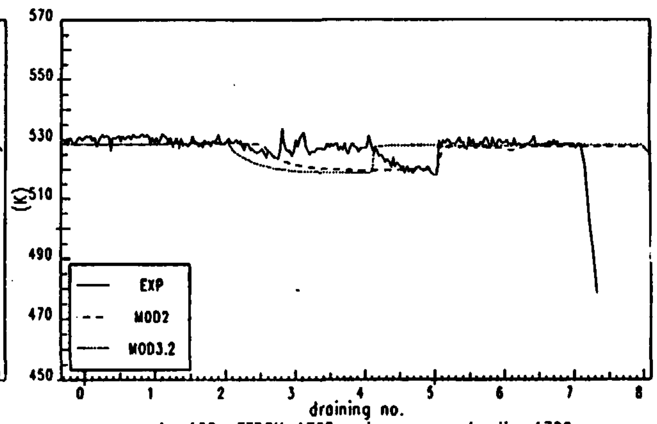

parameter 95 : TFSG2PR23C - SG 2 prim, tube 23, location C



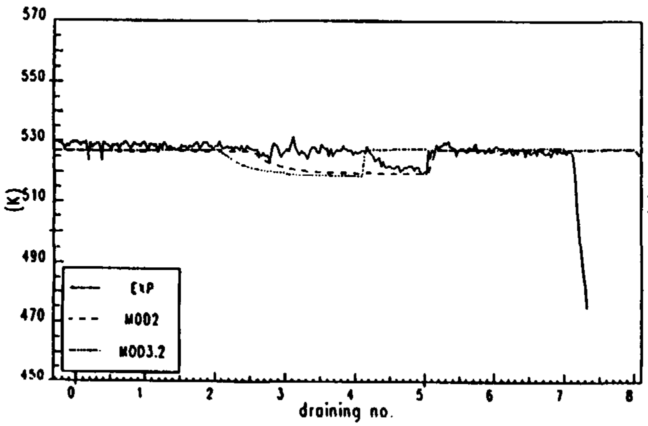

parameter 96 : TFSG3PR23A - SG 3 prim, tube 23, location A



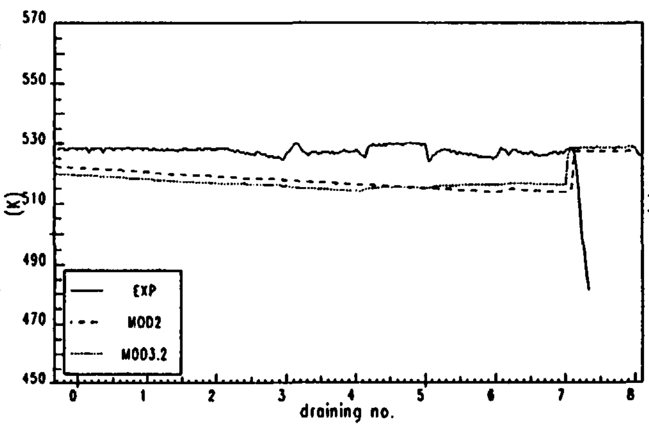

parameter 97 : TFSG3PR23B - SG 3 prim, tube 23, location B



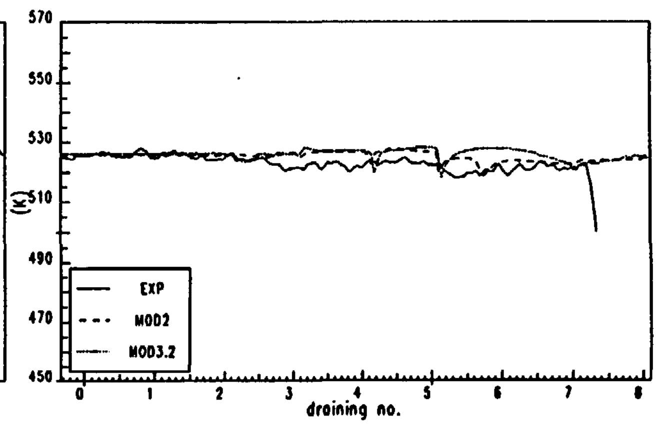

parameter 98 : TFSG3PR23C - SG 3 prim, tube 23, location C

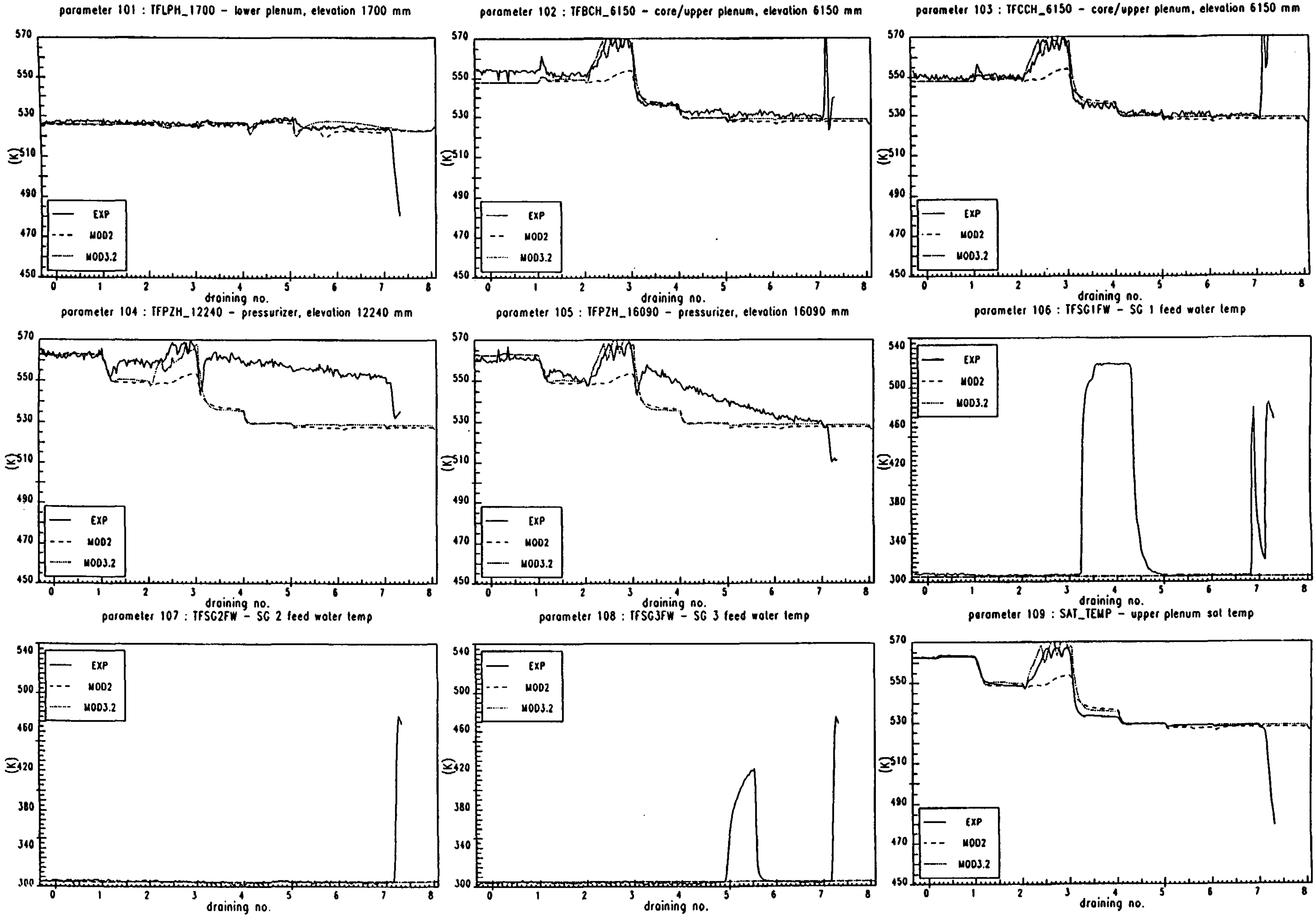


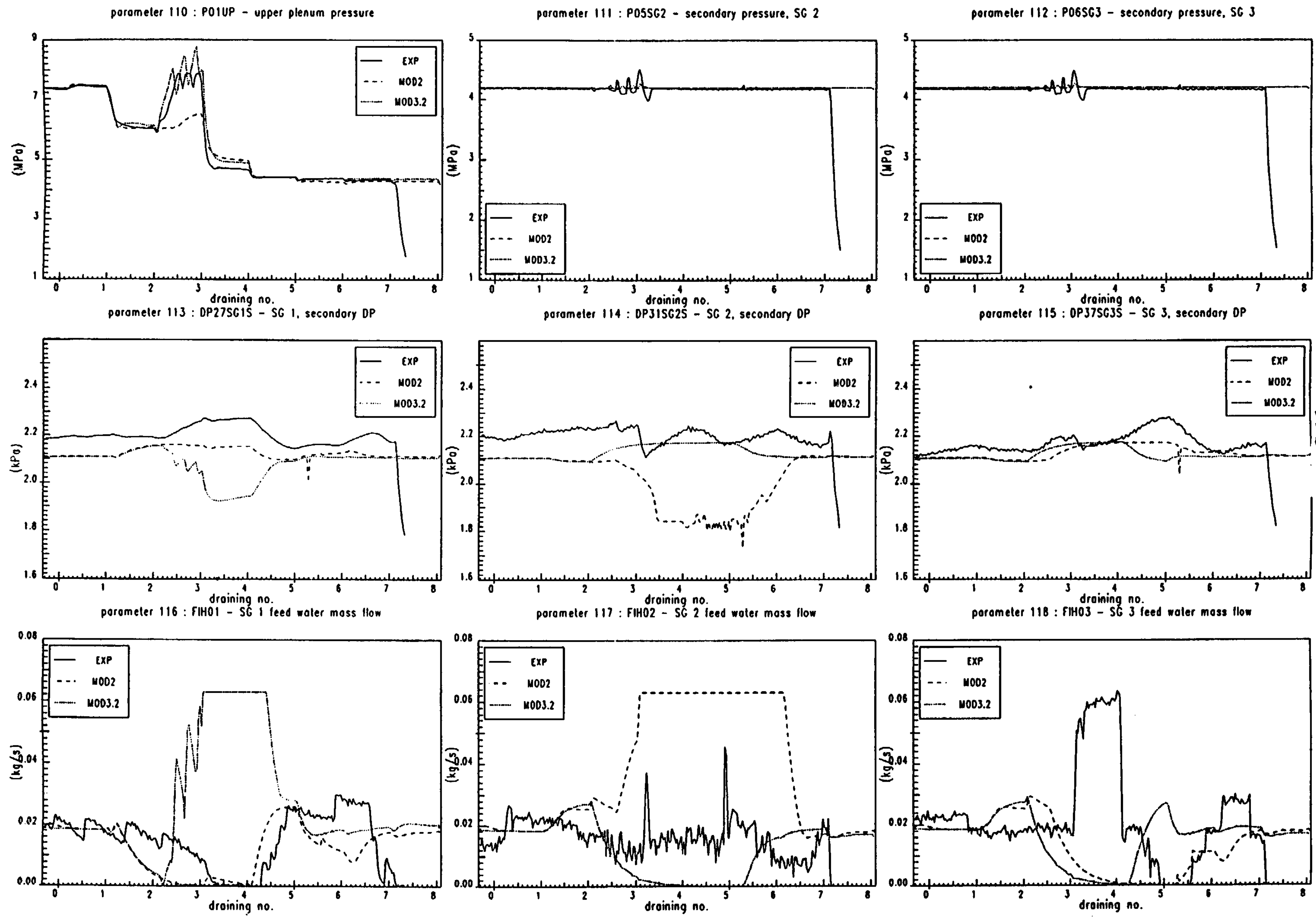

parameter 99 : TFDCH_7900 - downcomer, elevation 7900 mm




parameter 100 : TFDCH_1700 - downcomer, elevation 1700 mm

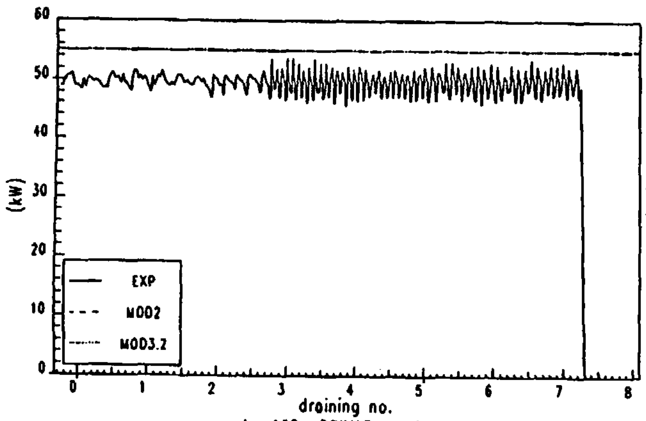



parameter 101 : TFLPH_1700 - lower plenum, elevation 1700 mm
parameter 102 : TFBCH_6150 - core/upper plenum, elevation 6150 mm
parameter 103 : TFCCH_6150 - core/upper plenum, elevation 6150 mm
parameter 104 : TFPZH_12240 - pressurizer, elevation 12240 mm
parameter 105 : TFPZH_16090 - pressurizer, elevation 16090 mm
parameter 106 : TFSG1FW - SG 1 feed water temp
parameter 107 : TFSG2FW - SG 2 feed water temp
parameter 108 : TFSG3FW - SG 3 feed water temp
parameter 109 : SAT_TEMP - upper plenum sat temp
(K)
draining no.
EXP
MOD2
MOD3.2

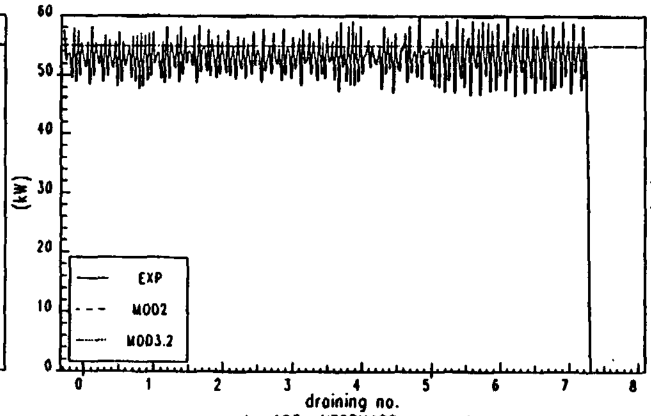


parameter 110 : P01UP - upper plenum pressure
parameter 111 : P05SG2 - secondary pressure, SG 2
parameter 112 : P06SG3 - secondary pressure, SG 3
parameter 113 : DP27SG1S - SG 1, secondary DP
parameter 114 : DP31SG2S - SG 2, secondary DP
parameter 115 : DP37SG3S - SG 3, secondary DP
parameter 116 : FIH01 - SG 1 feed water mass flow
parameter 117 : FIH02 - SG 2 feed water mass flow
parameter 118 : FIH03 - SG 3 feed water mass flow
EXP
MOD2
MOD3.2
(MPa)
(kPa)
(kg/s)
draining no.

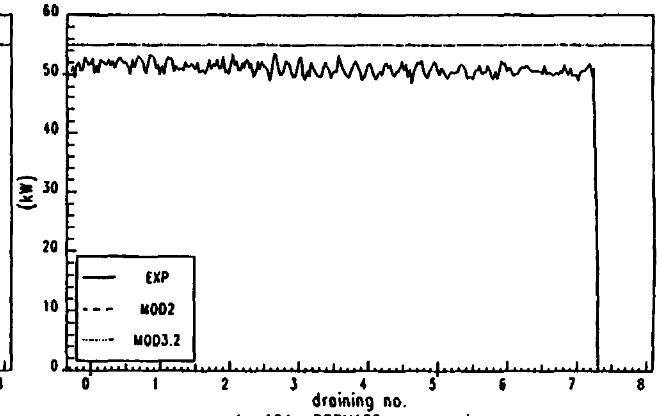
parameter 119 : EAC - core power, channel A



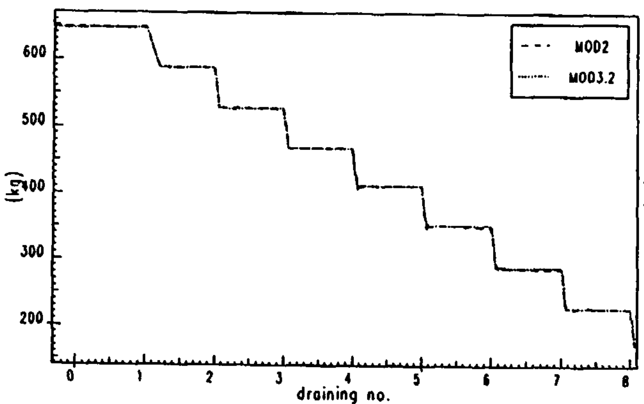

parameter 120 : EBC - core power, channel B



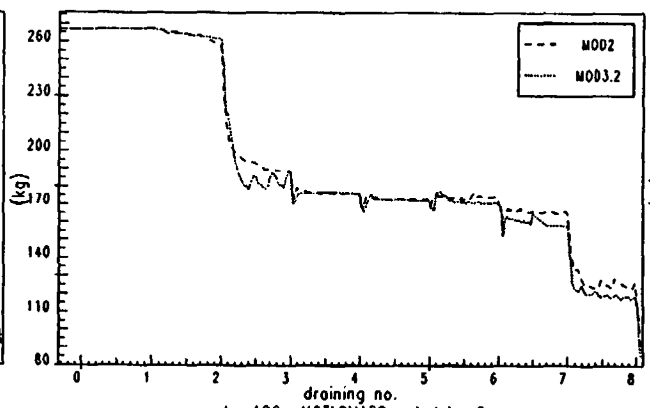

parameter 121 : ECC - core power, channel C



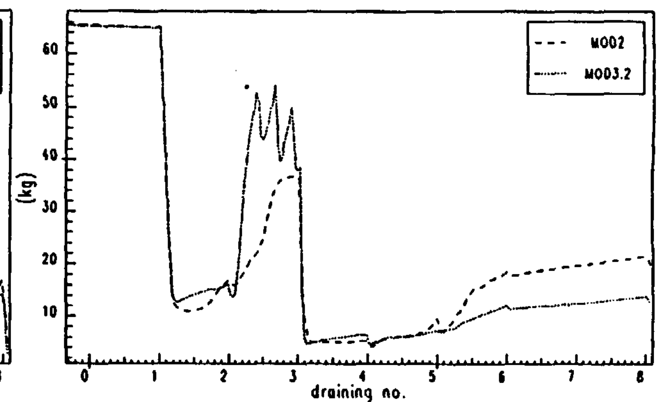

parameter 122 : PRIMAS - primary mass



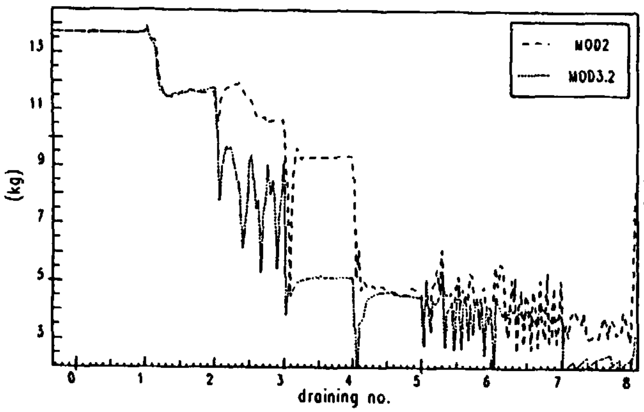

parameter 123 : VESSMASS - vessel mass



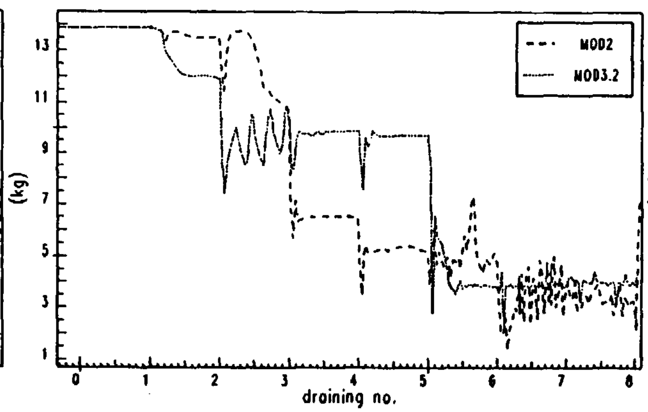

parameter 124 : PRZMASS - pressurizer mass



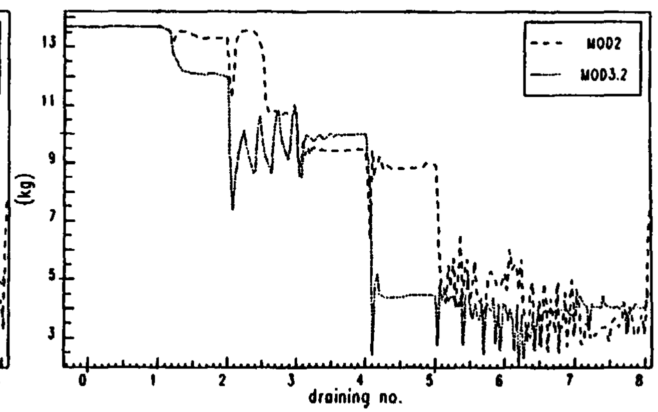

parameter 125 : HOTL1MASS - hot leg 1 mass



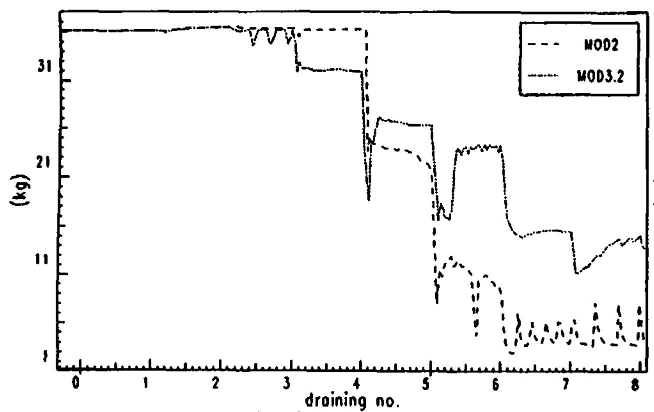

parameter 126 : HOTL2MASS - hot leg 2 mass



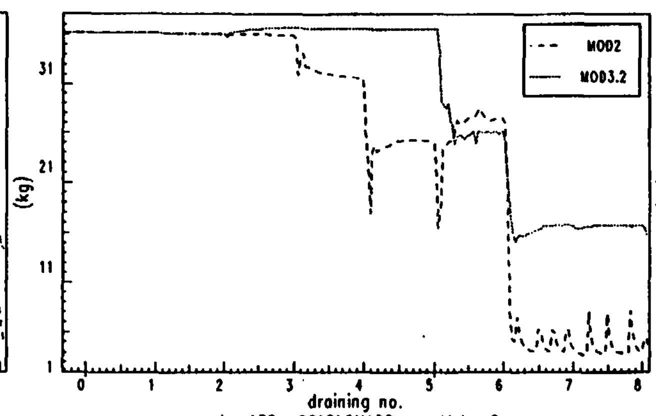

parameter 127 : HOTL3MASS - hot leg 3 mass



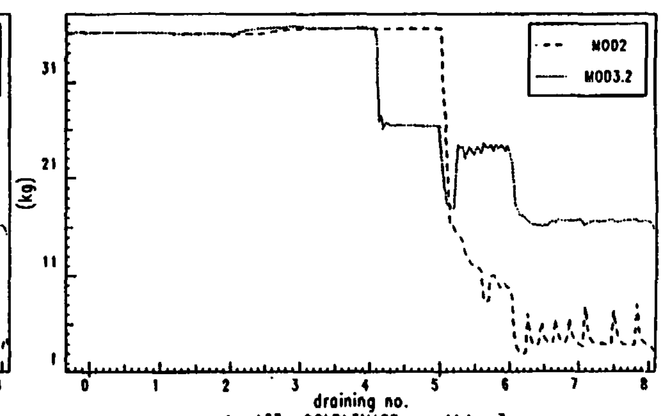
parameter 128 : SGTUBE1MASS - SG 1 tube mass



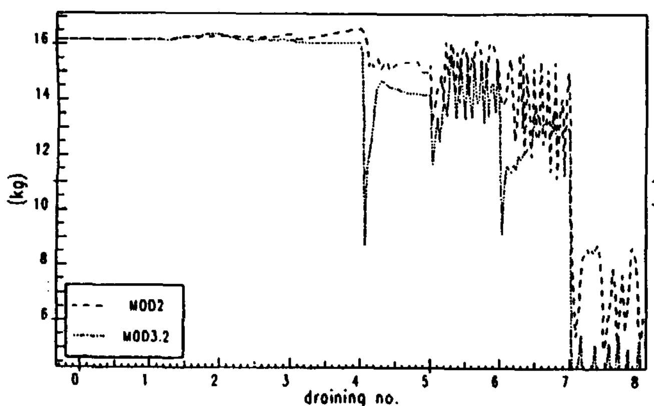

parameter 129 : SGTUBE2MASS - SG 2 tube mass



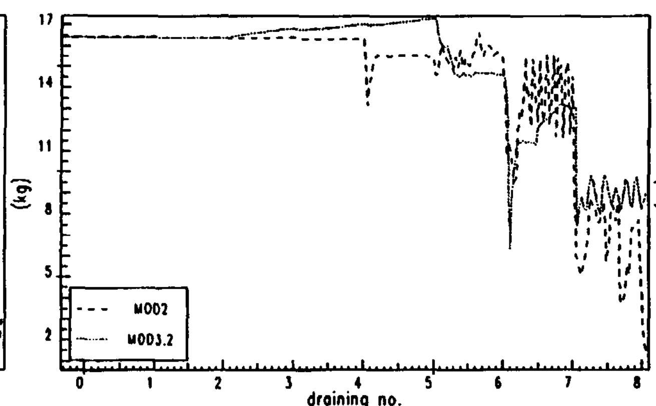

parameter 130 : SGTUBE3MASS - SG 3 tube mass



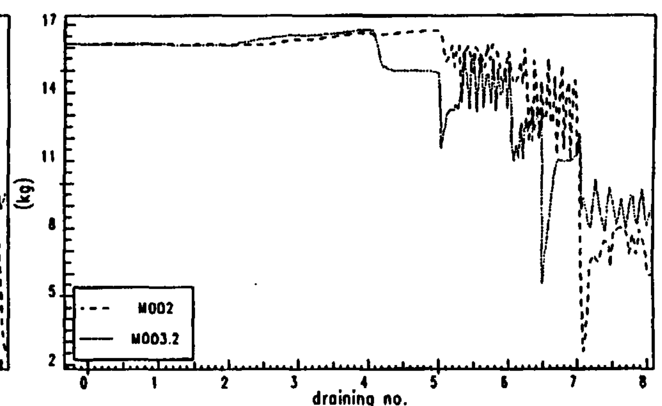

parameter 131 : COLDL1MASS - cold leg 1 mass



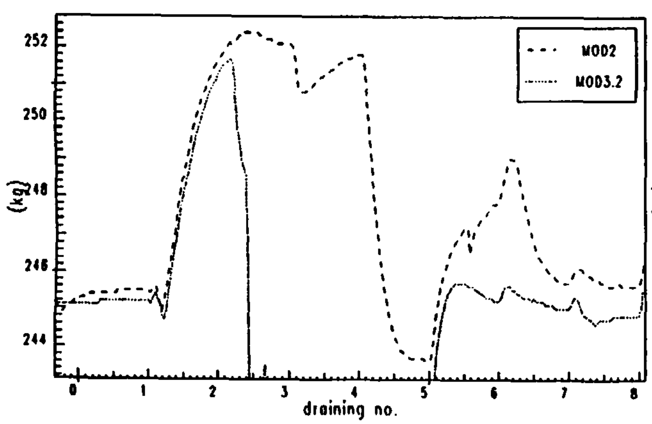

parameter 132 : COLDL2MASS - cold leg 2 mass



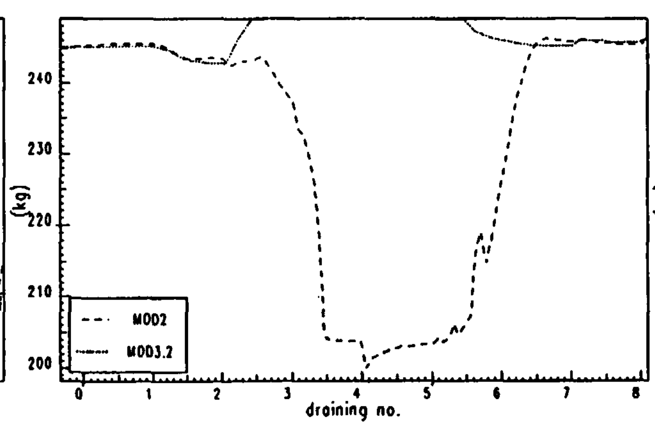

parameter 133 : COLDL3MASS - cold leg 3 mass



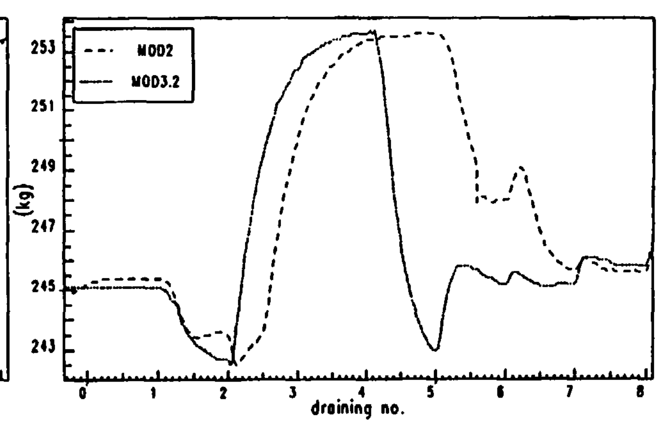

parameter 134 : SGSEC1MASS - SG 1 mass

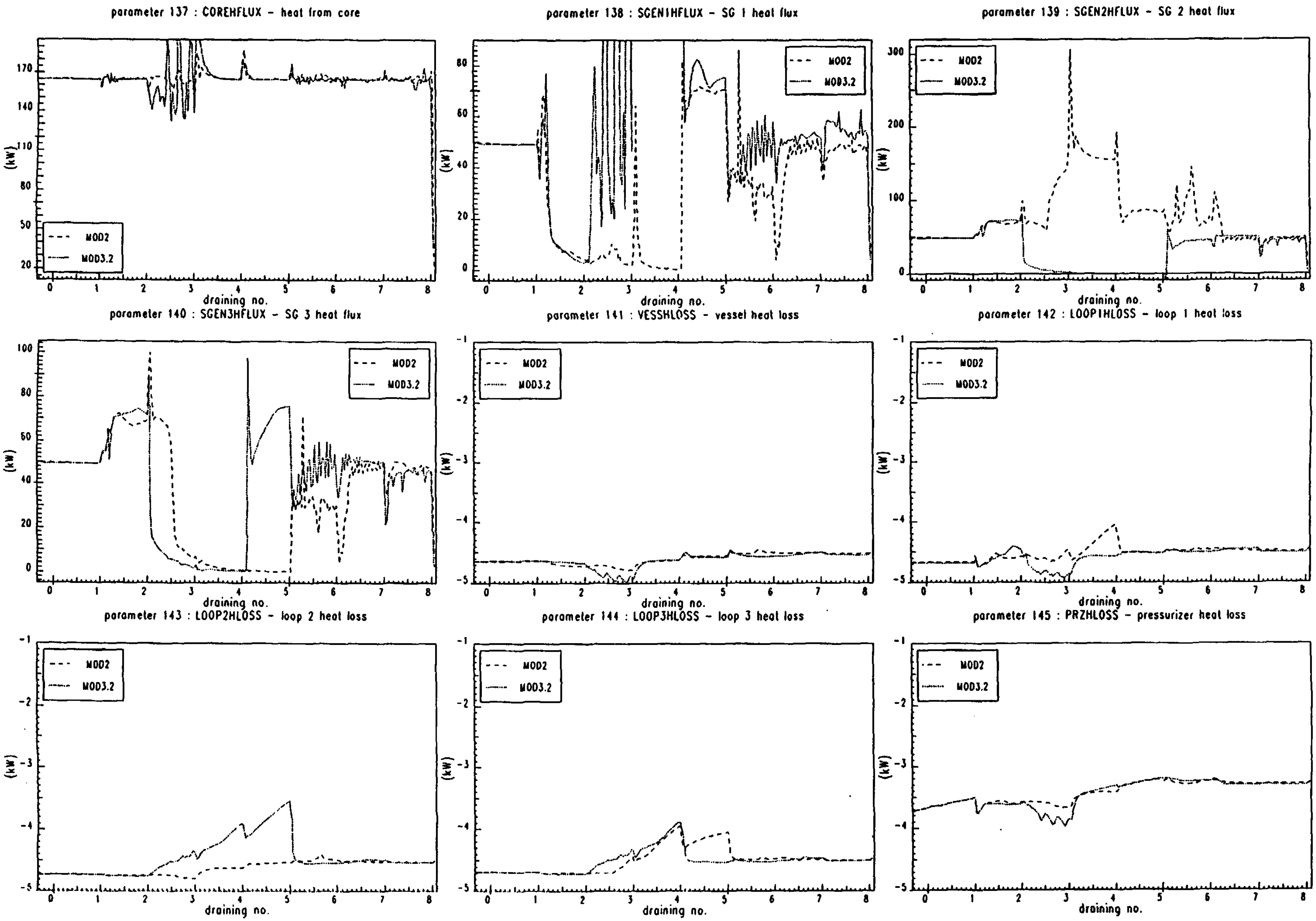



parameter 135 : SGSEC2MASS - SG 2 mass



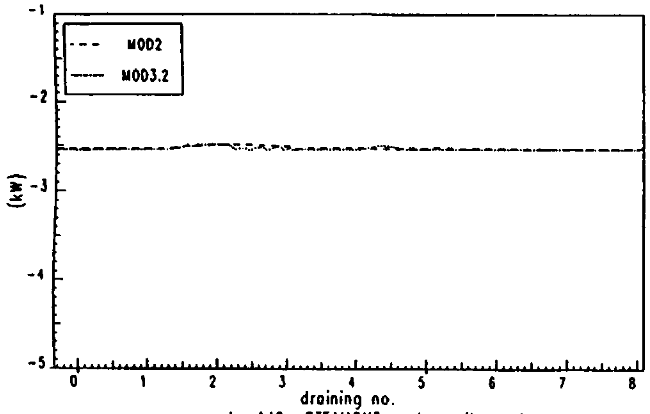

parameter 136 : SGSEC3MASS - SG 3 mass



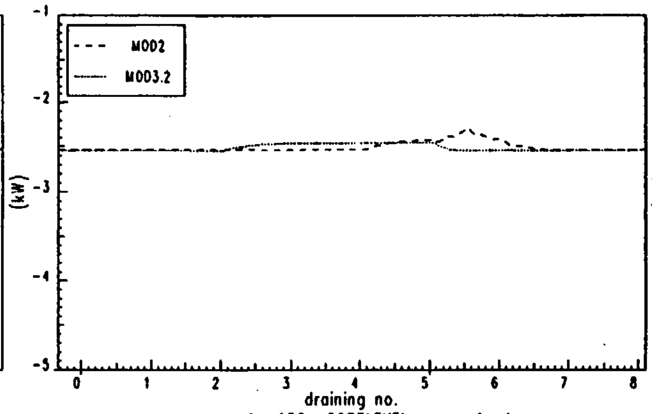


parameter 137 : COREHFLUX - heat from core
parameter 138 : SGEN1HFLUX - SG 1 heat flux
parameter 139 : SGEN2HFLUX - SG 2 heat flux
parameter 140 : SGEN3HFLUX - SG 3 heat flux
parameter 141 : VESSHLOSS - vessel heat loss
parameter 142 : LOOP1HLOSS - loop 1 heat loss
parameter 143 : LOOP2HLOSS - loop 2 heat loss
parameter 144 : LOOP3HLOSS - loop 3 heat loss
parameter 145 : PRZHLOSS - pressurizer heat loss
MOD2
MOD3.2
(kW)
draining no.

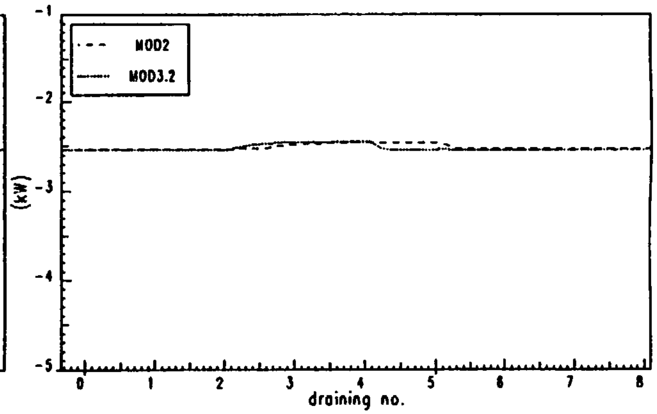
parameter 146 : SEC1HLOSS - SG 1 sec. heat loss



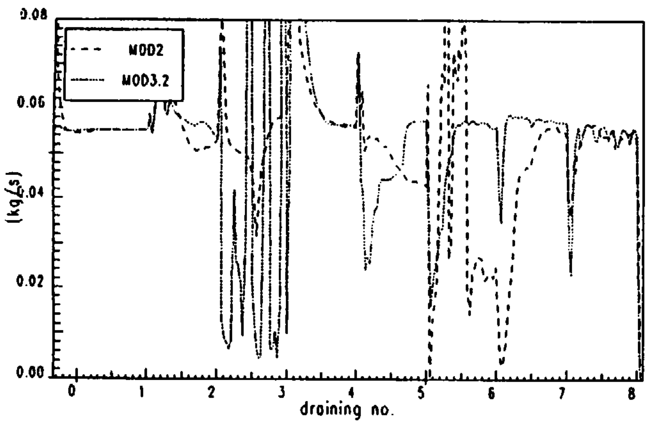

parameter 147 : SEC3HLOSS - SG 2 sec. heat loss



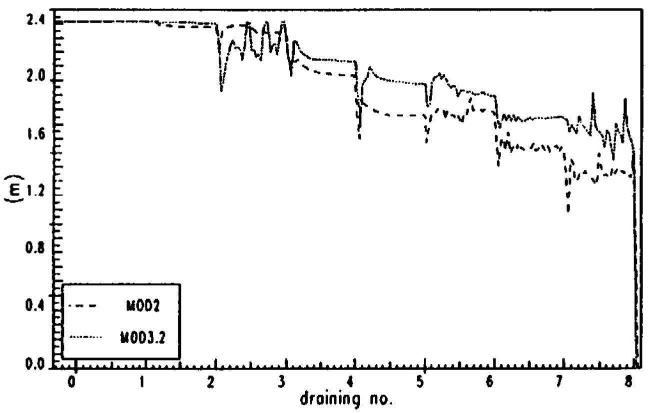

parameter 148 : SEC2HLOSS - SG 3 sec. heat loss




parameter 149 : STEAMOUT - steam flow out




parameter 150 : CORELEVEL - core level



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**10. SUPPLEMENTARY NOTES**

J. Uhle, NRC Project Manager


**11. ABSTRACT** *(200 words or less)*

The results of the pre-test and post-test calculations of OECD International Standard Problem no.33 (ISP-33) are presented. The frozen version of RELAP5 code version MOD2 and the latest released version MOD3.2 have been assessed against experimental data from PACTEL facility. Generally, predictions were in good agreement with experimental data, except in the most interesting part of the transient only MOD3.2 was able to follow periodic hot leg loop seal clearance phenomena and primary pressure oscillations closely.


**12. KEY WORDS/DESCRIPTORS** *(List words or phrases that will assist researchers in locating the report.)*

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SB-LOCA

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