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DEEP PENETRATION IN PURE SODIUM EXPERIMENTS USING THE HARMONIE SOURCE REACTOR

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RESUME :

La présente note documente les expériences de propagation de neutrons en sodium sur HARMONIE. On précise la géométrie de la maquette, les résultats des expériences et les résultats des calculs à une et deux dimensions.

The present note is a documentation of the neutron propagation experiments in sodium, performed on HARMONIE. Details are given on the geometrical specifications, experimental results and calculation, one and two dimensional, results.

[redacted]

PARIS, 10/11 Septembre 1984

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- INTRODUCTION -

The HARMONIE Sodium Integral experiments have been performed from 1976 to 1978. The aim was to study the deep neutron penetration in pure sodium in various conditions to improve, possibly with a sodium cross-sections adjustment, the performances of the propagation formulaire PROPANE ; this formulaire should allow in particular the calculation of the sodium activation in the heat exchanger of a French fast power reactor, pool type, with known uncertainties.

The source reactor HARMONIE, located at Cadarache in South France, has been used for these experiments.

Mainly, two experiments have been performed :

1) With HARMONIE stainless-steel reflector

2) This reflector is replaced by a spectrum converter of the type of an UO2-Na blanket, to simulate the neutron spectrum at the edge of a fast reactor blanket.

In this report we describe the experimental facility and the measurements performed.

We indicate the calculational methods used to analyze the experimental results and the discrepancies between experiment and calculation.

A - MEASUREMENTS

A-I - EXPERIMENTAL FACILITY -

A-I.1 - HARMONIE source reactor geometry and performances -

Figure 1 shows the outside of the source reactor HARMONIE located at Cadarache.

Figure 2 presents the three core positions ; in our experiments, the core is in position 2 and the concrete blocks number : 2, 3, 6 and 7 are eliminated.

This reactor allows to obtain a fast neutron spectrum within a slab source geometry.

Thr reactor core is a enriched Uranium (93% U235) vertical cylinder with 123 mm diameter and 129 mm heigh. It is surrounded by a depleted uranium blanket and a stainless-steel reflector.

The main characteristics of the core are :

- critical mass : 22.937 kg
- Average neutron energy in the core : 0.75 MeV
- Power : 2 KW
- Maximum flux : 1.25 10^{12} n/cm^2.sec

A-I.2 - Sodium tanks -

Figure 3 shows the sodium tank arrangement ; it is composed by :

- a central tank
- 4 half tanks surrounding the central tank
- a shield constituted with 4 fourty centimeters wood walle and with a wood roof.

The whole is placed on the upper reflector of the reactor HARMONIE at the place of concrete blocks.

1) Central tank : it is a vertical cylinder with 150 cm diameter (± 5 mm) and 275 cm high. The walls are in mild steel Martin A42C1 : 10 mm thickness. The bottom is of the same steel, but with a 6 mm thickness. Six radial channels for measurements are located each 50 cm in the axial direction. Channel 0 in figure 1 (and zone B in Appendix 5) is a measurement position "outside" the tanks, and used in particular for proton recoil measurements. Each channels is shifted by 15 degrees with respect to the previous one. They are made in AG5 with a 3 mm wall thickness and 60 mm diameter. The first channel (channel 1) is located at 73 cm from the center of the core. Each of the successive channels is 50 cm apart (the second is at 123 cm from the center of the core, the third at 173 cm and so on). The arrangement is such that we have seven measurements positions, 50 cm apart from each other, all on the core axis, in the propagation direction.

2) Lateral tanks : four lateral tanks are surrounding the central ones. Dimensions are 140x140x140 cm. The walls of these tanks are made of the same material then the former. The whole system forms a 280 cm cube.

3) Around this cube a wood shield is placed to protect from the diffused neutrons. The wood thickness is 30 cm.

4) All this tanks are filled with metallic sodium - "technology" quality. Its composition will be discussed later on. Care has been taken during the liquid sodium filling and during the progressice solidification to obtain an homogeneous medium.

A-II - SPECTRUM CONVERTER -

To simulate a neutron spectrum at the end of a fast reactor blanket a spectrum converter was used.

A part of the stainless-steel reflector was replaced by a Aluminium basket - 126x126x25 cm - filled by UO2 and Na rodlets, MASURCA type. The homogeneized composition of this medium is given in the Table I.

A-III - MATERIALS -

Table I gives the summary of the nuclear densities of the materials used in the experiments. For the sodium, the concentrations of impurities were not known very accurately particularly the oxygen and hydrogen concentrations.

TABLE I : NUCLEAR DENSITIES OF MATERIALS

	Core	Radial Blanket	Axial blanket	Blanket UO2-Na (Converter)	Reflector	Stainless-steel HARMONIE (zone F)**	Tanks (Container)	Sodium	Wood	Al	Concrete
U235	4.235- *	1.424-4	1.620-4	4.135-5							
U238	3.072-3	3.545-2	4.035-2	9.730-3							
Ni	3.181-4	1.760-3	6.121-4	7.628-4	8.694-3	9.073-3	9.073-3				
Cr	6.465-4	3.576-3	1.244-3	1.550-3	1.613-2	1.683-2	1.683-2				
Fe	2.408-3	1.332-2	4.633-3	5.774-3	5.50 -2	5.740-2	5.740-2				9.84-3
Mn					1.659-3	1.731-3	1.731-3				
Si					1.623-3	1.693-3	1.693-3				6.37-3
O				1.954-2				3.6 -6	1.04 -3		3.96-2
Na				1.015-2				2.54-2			
Alu										6.0-2	
B10											3.64-4
B11											1.58-3
C									1.046-2		4.69-3
H								2.50-5	1.980-2		4.63-3
Ca								1.0 -5			

* Read 4.235 10^{-2} (x 10^{24}) atoms/cm^3

** See Appendix 5

A-IV - MEASUREMENTS AND ACCURACIES -

1) Spectrum measurements : Neutron spectra were measured by the proton recoil technique in channel 0 and in channel 1. In the energy range between 80 KeV - 1350 MeV, the accuracy was estimated to be ± 10%.

2) Integral measurements : Five integral detectors wer used : Rh(n,n') and S(n,p) for the high energies. We used (n,γ) reactions : Na/Cd, Mn/Cd, Au/Cd, for the low energies. The integral detectors are placed in the channel which is filled with aluminum to restore a Na-type medium and to minimize the disturbance on the neutron fluxes in the sodium tank. The counting method is classical. Experimental accuracies are :

± 15% for Rh and S
± 5% for the other detectors

A-V - EXPERIMENTAL RESULTS -

A-V.1 - Neutron spectrum -

The neutron spectrum measured in the channel 0 and the channel 1 are given in the Table II. The results are normalized to 1 in the range between 80 - 1350 KeV and are given in the multigroup structure PROPANE Do (given in Appendix 9).

The counting rate ratio between the channel 0 and the channel 1 is 2.686 in the case without blanket and 3.338 in the case with blanket.

The uncertainties on the experimental values are evaluated at ± 10%.

TABLE II - EXPERIMENTAL NEUTRON SPECTRUM

Group	Channel 0		Channel 1	
Number	With blanket	Without blanket	With blanket	Without blanket
6	0.0281	0.0168	0.0209	0.0094
7	0.0206	0.0212	0.0180	0.0114
8	0.0322	0.0405	0.0333	0.025
9	0.0214	0.0269	0.0218	0.0161
10	0.0548	0.0684	0.0500	0.040
11	0.0617	0.0885	0.0656	0.0588
12	0.0358	0.0486	0.0413	0.0406
13	0.0096	0.0134	0.019	0.0246
14	0.0288	0.0401	0.0263	0.0240
15	0.0915	0.1163	0.0834	0.0918
16	0.0970	0.1043	0.1008	0.0836
17	0.1131	0.104	0.114	0.1083
18	0.194	0.1682	0.1706	0.2032
19	0.2160	0.1427	0.235	0.2632

A-V.2 - Integral detectors -

The experimental results are given in the Table III in the case with blanket and the Table IV in the case without blanket.

For each detectors, two independent measurements were made in each position to verify that the counting rates are reproducible inside the experimental uncertainties.

Measurements are normalized to 1 in the channel 1.

TABLE III - WITH BLANKET

Position	Sulfur	Rhodium	Na/Cd	Mn/Cd
Channel 0	4.78	3.645	1.419	1.072
" 1	1.0	1.0	1.0	1.0
" 2	$7.18 \; 10^{-2}$	$6.29 \; 10^{-2}$	0.506	0.335
" 3	$7.03 \; 10^{-3}$		0.227	0.119
" 4			$8.411 \; 10^{-2}$	$3.20 \; 10^{-2}$
" 5			2.450	$8.38 \; 10^{-3}$
" 6			$6.62 \; 10^{-3}$	2.20

TABLE IV - WITHOUT BLANKET

Position	Rhodium	Na/Cd	Mn/Cd	Au/Cd
Channel 0	4.79	2.037	1.155	1.321
" 1	1.0	1.0	1.0	1.0
" 2	$4.49 \; 10^{-2}$	0.492	0.406	0.553
" 3	$2.05 \; 10^{-3}$	0.212	0.136	0.252
" 4	not measured	$7.77 \; 10^{-2}$	$3.79 \; 10^{-2}$	$9.82 \; 10^{-2}$
" 5	"	2.33	$9.54 \; 10^{-3}$	2.91
" 6	"	$6.44 \; 10^{-3}$	2.59	$7.21 \; 10^{-3}$

B - CALCULATIONS

B-I - *ONE-DIMENSIONAL CALCULATIONS* -

B-I.1 - *Geometry* -

The ANISN one-dimensional transport code is used in spheric geometry with a shell source.

The ANISN card list is given in the Appendix 3.

B-I.2 - *Weighting procedure* -

An appropriate weighting procedure has been used to collapse the sodium cross-sections and the detectors cross-sections from the original 113 groups BABEL library to the PROPANE 45 groups structure.

Two spatial zones are required to treat correctly the neutron propagation in the sodium with respect to the reference method.

Note : The first zone includes 100 cm in sodium, starting from the tank edge nearest to the core. The second zone includes the remaining sodium (from 100 cm to the top of the tank, approximately 180 cm in sodium).

Table V presents the discrepancies with the reference method : 113G/S16/P3 for the integral detectors :

<u>TABLE V</u> - $E(\%) = \dfrac{\phi(113/S16/P3) - \phi(45/S16/P3)}{\phi_{ref.}}$

Channel	S	Rhodium	Mn/Cd	Na/Cd	Au/Cd
2	2.8	1.9	- 4	1.6	2
3	3.7	3.5	- 3	1.6	2
4	5.2	5.5	- 1.4	1.4	2.2
5	7.6	7.6	- 0.4	1.7	3.0
6	10.9	10.4	1.8	6.7	6.5

For the detector cross-sections, the weighting procedure has negligible effects (≈ 1-2%) as expected from the optimization of the multigroup structure.

B-I.3 - <u>Spatio angular tests</u> -

A 5 cm spatial mesh size in sodium was found to be appropriate for the flux convergence. With 3 cm spatial meshes the observed differences are less than two per cent for the Sulfur and Rhodium detectors and negligible for Na/Cd, Au/Cd and Mn/Cd.

Finally, Table VI gives the discrepancies with respect to the reference method for the Sn quadrature.

<u>TABLE VI</u> - $E(\%) = \dfrac{\phi(45/S16/P3) - \phi(45/Sn/P3)}{\phi(45/S16/P3)}$

	S4		S	
	S	Na/Cd	S	Na/Cd
Channel 2	7.5	1.5	- 1.5	- 0.3
" 4	13.5	2.2	- 1.5	- 0.9
" 6	31.0	0.7	- 5.0	- 1.0

We observe that the S16 quadrature is required for the high energy detectors while the S4 is adequate for the low energy detectors.

In the same way, the P3 scattering development is required for all the calculations.

B-I.4 - Boundary conditions and impurities -

The following treatment was adopted for the experimental boundaries conditions. It was found that the description of the stainless-steel bottom tank and of the wood shield is necessary. Moreover the sodium impurities - especially the hydrogen - must be carefully taken into account.

The uncertainty in the amount of these constituents will increase the global calculation (or experimental) uncertainties.

In absence of more precise informations on the impurities in the sodium, we have taken into account what is given by the supplier of the commercial sodium we used.

B-I.5 - Neutron source -

The neutron source to propagate in the sodium for the one-dimensional calculations comes from the two dimensional calculations (see section B-II).

However, in channel 0, where the spectrum is measured under the central sodium tank, we can compare the experiment and the spectrum calculated by the DOT (R,Z) code.

The comparison is made in the two cases : with and without blanket.

TABLE VII - NEUTRON SPECTRA IN THE CHANNEL 0

	With blanket		Without blanket	
	Experiment	Calculation DOT (R,Z) 45G	Experiment	Calculation DOT (R,Z) 45G
550 KeV En 1.35 MeV	8.0 %	8.8 %	7.8 %	8.9 %
294 " En 550 KeV	18.3	16.1	25.5	22.2
150 " En 294 "	33.0	33.8	36.4	34.5
80 " En 150 "	40.5	41.1	30.1	34.2

We observe a good agreement between the experiment and the calculations in this energy range (80 - 1350 KeV).

Above 1.35 MeV, only the threshold detectors can be used to have informations on that energy range. For the Sulfur detector (threshold ≈ 800 KeV), the experimental counting rate ratio between the cases with and without blanket is : 13.7 to compare with 14.4 in the calculations.

So we observe that the calculated neutron spectrum used for the propagation in the sodium is in fairly good agreement with measurements, specially in the energy range which is important for deep penetration (i.e. above 100 KeV).

The angular distribution of the neutron source is given by the DOT (R,Z) calculations. No measurements have been performed for this purpose. However, the elimination of one of the forward components of the source (in a spherical S4 calculation, which is a very drastic condition), changes the attenuation of the integral detector response (Na/Cd) by only 4% in a 2.5 m propagation length.

B-I.6 - Calculational results -

With the specified options, the results of the 1D calculation are given in the Table VIII for the HARMONIE configuration with blanket :

TABLE VIII - HARMONIE WITH BLANKET

	Sulfur (S16)	Rhodium (S16)	Na/Cd (S4)	Mn/Cd (S4)	Au/Cd (S4)
Channel 1	1.	1.	1.	1.	1.
" 2	$6.67\ 10^{-2}$	$6.797\ 10^{-2}$	0.505	0.343	0.652
" 3	$6.22\ 10^{-3}$	$6.10\ 10^{-3}$	0.212	$9.07\ 10^{-2}$	0.304
" 4	$6.55\ 10^{-4}$	$6.19\ 10^{-4}$	$7.33\ 10^{-2}$	2.38	0.105
" 5	$7.37\ 10^{-5}$	$6{:}75\ 10^{-5}$	2.18	$6.09\ 10^{-3}$	$3.03\ 10^{-2}$
" 6	$8.63\ 10^{-6}$	$7.61\ 10^{-6}$	$5.46\ 10^{-3}$	1.42	$7.31\ 10^{-3}$

and in the Table IX for HARMONIE without blanket :

TABLE IX - HARMONIE WITHOUT BLANKET

	Sulfur (S16)	Rhodium (S16)	Na/Cd (S4)	Mn/Cd (S4)	Au/Cd (S4)
Channel 1	1.	1.	1.	1.	1.
" 2	$6.48\ 10^{-2}$	$4.14\ 10^{-2}$	0.478	0.357	0.562
" 3	$5.77\ 10^{-3}$	$2.06\ 10^{-3}$	0.196	$9.71\ 10^{-2}$	0.252
" 4	$5.92\ 10^{-4}$	$1.14\ 10^{-4}$	$6.71\ 10^{-2}$	2.55	$8.66\ 10^{-2}$
" 5	$6.56\ 10^{-5}$	$7.02\ 10^{-6}$	1.99	$6.47\ 10^{-3}$	2.51
" 6	$7.68\ 10^{-6}$	$4.94\ 10^{-7}$	$5.02\ 10^{-3}$	1.50	$6.08\ 10^{-3}$

The differences observed in the Rhodium response between the two cases, with and without blanket, come from the large differences in the source spectrum above 2 MeV.

Figures 4 to 7 present the results for the Na/Cd and Mn/Cd detectors in the case with and without blanket.

Note that both S4 and S16 calculations were necessary, to calculate S16/S4 correction factors for the high energy detectors, to be used in 2D calculation (see paragraph B-II.3).

B-I.7 - Sensitivity calculations -

We have performed sensitivity calculations with the following calculational model :

- spherical geometry
- shell source coming fromDOT calculations
- P3 approximation
- S4 quadrature for low energy detectors
- S16 quadrature for high energy detectors
- spatial mesh : 5 cm
- appropriate weighting procedure to collapse the 45 group library from the original one (113 G).

In our cross-sections adjustment procédure we do not use the absolute detector rates but the attenuation of each reaction rate between two points (i.e., reaction rate ratios). This is done in order to reduce the uncertainties related to the cross-section of each detector, and those related to the experimental precision.

We calculated with the GIANT-NL code the importance functions for the various detectors located in the chooseen positions.

Then the ROSCOFF code calculates the sensitivity profiles to the sodium cross-sections (total, absorption, elastic and inelastic scattering) for these positions.

In figures 8 to 9, we show an example of the results for the Au/Cd and Mn/Cd detectors in two cases :

Ratio Pos 1/Pos 3 i.e. Channel 1/Channel 3
Ratio Pos 3/Pos 6 i.e. Channel 3/Channel 6

and two configurations : with and without blanket.

The Appendix 1 gives the sensitivity coefficients for the Na/Cd detector for two positions and for the two configurations (with and without blanket).

The usual definitions of the sensitivity coefficients are found in the column SIGTOT, $(\partial R/R)/(\delta\sigma_{tot}/\sigma_{tot})$; SIGSCT for $\sigma_{scattering}$, SUM (= total sensitivity). The UABSOR, UINELS, ULAST are the sensitivity coefficients as defined by Mc Cracken (see for example the Proceeding of the OECD specialist' Meeting on Shielding Benchmark and Differential Data, Vienna 1976).

B-II - TWO DIMENSIONAL CALCULATIONS -

B-II.1 - Geometry -

The schematization is shown in the Appendix 5. This is a complete representation of the core and the propagation media. In particular the description of the lateral sodium tanks and the wood shield is taken into account.

All the propagation calculations, were distributed (volume) source calculations and were performed on the complete geometry, shown in Appendix 5. In Appendix 6, the DOT 3.5 input data are shown.

B-II.2 - Distributed source -

The distributed source was obtained with a k calculation performed with the geometry of the Appendix 5 but reduced on the Z direction and with appropriate albedos.

The Appendix 7 gives the distributed source for the case without blanket and the Appendix 7bis for the case with blanket.

The Appendix 8 gives the fission spectrum to be used in the calculations.

B-II.3 - Cross-sections and calculational options -

For the Na, the cross-sections used are the same then in the ANISN calculations.

For the other media, the cross-sections come from the PROPANE Do library : the reference BABEL 113 groups library is collapsed in the PROPANE 45 groups multigroup structure given in Appendix 9.

The following calculational options are used :

- R,Z geometry
- 45 groups
- S4 (Sulfur and Rhodium are S16 corrected with the one-dimensional correction factors)
- P3
- Distributed sources in core reflector and blanket (or not) normalized to 1
- Spatial mesh : 5 cm in the sodium

All details are found in the Appendix 6 (DOT input).

B-II.4 - Calculational results -

Table X gives the results of the DOT (R,Z) propagation calculation, for the case with blanket :

TABLE X - HARMONIE WITH BLANKET

	Sulfur	Rhodium	Na/Cd	Mn/Cd	Au/Cd
Channel 1	1.	1.	1.	1.	1.
" 2	7.72 10^{-2}	7.33 10^{-2}	0.451	0.364	0.640
" 3	6.93 10^{-3}	6.96 10^{-3}	0.199	0.103	0.332
" 4	6.90 10^{-4}	7.33 10^{-4}	7.35 10^{-2}	2.73 10^{-2}	0.128
" 5	8.01 10^{-5}	8.34 10^{-5}	2.34	7.04 10^{-3}	4.05 10^{-2}
" 6	9.49 10^{-6}	9.58 10^{-6}	6.33 10^{-3}	1.69	1.07

The Table XI concerns the case without blanket

TABLE XI - HARMONIE WITHOUT BLANKET

	Sulfur	Rhodium	Na/Cd	Mn/Cd	Au/Cd
Channel 1	1.	1.0	1.0	1.0	1.0
" 2	3.91 10^{-2}	4.65 10^{-2}	0.408	0.364	0.487
" 3	3.27 10^{-3}	2.73 10^{-3}	0.171	0.105	0.231
" 4	3.48 10^{-4}	1.78 10^{-4}	6.15 10^{-2}	2.82 10^{-2}	8.60 10^{-2}
" 5	4.05 10^{-5}	1.29 10^{-5}	1.9 10^{-2}	7.2 10^{-3}	2.70
" 6	4.85 10^{-6}	1.01 10^{-6}	5.2 10^{-3}	1.70	7.13 10^{-3}

The uncertainties on the calculations come essentially from the uncertainties on the sodium composition, particularly on the hydrogen impurities.

An upper limit for this uncertainty was evaluated to be ± 5% around the central value calculated with 45 ppm hydrogen for the range 23-68 ppm hydrogen (for all detectors).

In our case where we are interested by the ratio between two positions, the uncertainties on the ratio calculated are less than 4%, at worse, in the second part of the sodium tank.

B-II.5 - E-C/C values -

With the results given in the sections A-V.2 and B-II.4, we can calculate the discrepancies between experiment and two dimensionals calculations.

Tables XII and XIII for HARMONIE with and without blanket :

TABLE XII - WITH BLANKET - E-C/E (%)

	Sulfur	Rhodium	Na/Cd	Mn/Cd
Channel 1	0	0	0	0
" 2	- 7	- 14.19	+ 12.2	+ 5.8
" 3	+ 20	no measures	+ 14.0	+ 15.5
" 4	no measures	"	+ 14.4	+ 17.2
" 5	"	"	+ 4.7	+ 19.0
" 6	"	"	+ 4.6	+ 30.0

TABLE XIII - WITHOUT BLANKET

	Rhodium	Na/Cd	Mn/Cd	Au/Cd
Channel 1	0	0	0	0
" 2	- 3.44	+ 20.6	+ 11.5	+ 13.6
" 3	- 25.0	+ 23.9	+ 29.5	+ 9.1
" 4		+ 26.3	+ 34.4	+ 14.2
" 5		+ 22.6	+ 32.5	+ 7.8
" 6		+ 21.5	+ 52.3	+ 1.1

In the case with blanket, we have eliminated the Au/Cd results for experimental problems ; in the case without blanket we have eliminated the Sulfur for the same reason.

The global E-C/C uncertainties including both the experimental and calculational uncertainties coming from the Na composition, are :

± 10% for all low energy detectors
± 20% for high energy detectors

- CONCLUSIONS -

The aim of this Benchmark pure sodium experiments was to compare the experiment values with the calculation values obtained with the formulaire PROPANE Do in its non adjusted version.

These results and those obtained with the TAPIRO experiments concerning stainless-steel sodium mixtures (with various percentage) are used in our adjustment procedure to obtain the adjusted version : PROPANE 1.

In this report we have summarized the experimental facility and the experimental results obtained.

We have indicated the calculational method used for the analysis of these experiments.

The results obtained show an underestimation in the calculation, increasing with the penetration. This fact is coherent with our analysis (using both our reference methods, BABEL and PROPANE Do) of the TSF experiments concerning the same medium and larger propagation length.

[illegible] Na/Cd Pos 1/Pos 3 - Sensitivity to sigma Na

GRP.	SIGTOT	[illegible]	[illegible]	[illegible]	SUM	UABSOR	UINELS	UELAST
1	1.21572E-04	0.0	0.0	-1.12541E-04	8.96934E-06	7.37801E-06	5.33615E-07	1.07766E-06
2	2.22392E-03	0.0	0.0	-2.08701E-03	1.36905E-04	5.84951E-06	7.94600E-05	5.15937E-05
3	7.30849E-03	0.0	0.0	-6.96630E-03	3.42190E-04	5.09665E-07	1.50562E-04	1.91116E-04
4	1.00428E-02	0.0	0.0	-9.64204E-03	4.00773E-04	7.51597E-07	1.25333E-04	2.74701E-04
5	1.07305E-02	0.0	0.0	-1.03109E-02	4.19620E-04	8.65770E-07	9.26757E-05	3.26071E-04
6	3.65934E-02	0.0	0.0	-3.55029E-02	1.09049E-03	2.30965E-06	2.22551E-04	8.65612E-04
7	1.91923E-02	0.0	0.0	-1.89118E-02	2.80511E-04	9.49542E-07	5.29895E-05	2.26566E-04
8	2.10795E-02	0.0	0.0	-2.04558E-02	6.23799E-04	1.68163E-06	6.96645E-05	5.52340E-04
9	1.93001E-02	0.0	0.0	-1.79926E-02	1.30749E-03	2.37246E-06	2.42737E-05	1.28084E-03
10	5.49637E-02	0.0	0.0	-5.26940E-02	2.26970E-03	4.51362E-06	2.35759E-05	2.18079E-03
11	6.91295E-02	0.0	0.0	-6.67577E-02	2.37185E-03	6.97165E-06	0.0	2.36487E-03
12	4.04999E-02	0.0	0.0	-3.88434E-02	1.65646E-03	7.73503E-06	0.0	1.64671E-03
13	1.16745E-02	0.0	0.0	-1.11203E-02	5.54241E-04	2.75157E-06	0.0	5.51487E-04
14	3.91121E-02	0.0	0.0	-3.69711E-02	2.14102E-03	9.78018E-06	0.0	2.13203E-03
15	1.17871E-01	0.0	0.0	-1.14630E-01	3.24130E-03	1.88997E-05	0.0	3.22240E-03
16	1.32773E-01	0.0	0.0	-1.28477E-01	4.29560E-03	2.61937E-05	0.0	4.26953E-03
17	1.71024E-01	0.0	0.0	-1.62870E-01	8.15400E-03	3.52583E-05	0.0	8.11609E-03
18	3.31286E-01	0.0	0.0	-3.17268E-01	1.40187E-02	2.29172E-04	0.0	1.37893E-02
19	4.77746E-01	0.0	0.0	-4.57211E-01	2.05342E-02	2.87646E-05	0.0	2.05053E-02
20	2.65534E-01	0.0	0.0	-2.52552E-01	1.29819E-02	1.76946E-05	0.0	1.29640E-02
21	9.09247E-01	0.0	0.0	-8.77842E-01	3.14052E-02	2.39752E-04	0.0	3.11651E-02
22	1.02925E+00	0.0	0.0	-9.82909E-01	4.63462E-02	7.51230E-04	0.0	4.55950E-02
23	1.19495E-01	0.0	0.0	-1.13226E-01	6.26910E-03	6.84776E-06	0.0	6.26222E-03
24	3.06345E-01	0.0	0.0	-2.89916E-01	1.64294E-02	1.74042E-05	0.0	1.64119E-02
25	1.07928E+00	0.0	0.0	-1.02414E+00	5.51414E-02	6.14946E-05	0.0	5.50793E-02
26	1.51189E+00	0.0	0.0	-1.44179E+00	7.00960E-02	9.63342E-05	0.0	6.99987E-02
27	1.48230E+00	0.0	0.0	-1.44149E+00	4.08039E-02	3.27949E-04	0.0	4.04756E-02
28	1.39935E+00	0.0	0.0	-1.40491E+00	-5.56755E-03	6.03453E-04	0.0	-6.17254E-03
29	2.93998E-01	0.0	0.0	-2.94658E-01	-6.59575E-04	2.59849E-04	0.0	-9.19405E-04
30	2.95252E-01	0.0	0.0	-2.95414E-01	-1.61556E-04	3.28210E-04	0.0	-5.09845E-04
31	8.74246E-01	0.0	0.0	-8.79470E-01	-5.22405E-03	1.42219E-03	0.0	-6.64683E-03
32	1.61982E+00	0.0	0.0	-1.59608E+00	2.37379E-02	3.82956E-03	0.0	1.94075E-02
33	1.78867E+00	0.0	0.0	-1.71545E+00	7.32212E-02	4.25024E-03	0.0	6.89703E-02
34	1.49507E+00	0.0	0.0	-1.43212E+00	6.29506E-02	3.54645E-03	0.0	5.94093E-02
35	2.37249E+00	0.0	0.0	-2.27394E+00	9.85510E-02	5.88616E-03	0.0	9.26640E-02
36	2.26528E+00	0.0	0.0	-2.17541E+00	8.98655E-02	5.97024E-03	0.0	8.36960E-02
37	2.15722E+00	0.0	0.0	-2.07185E+00	8.53740E-02	6.26640E-03	0.0	7.90859E-02
38	3.03299E+00	0.0	0.0	-2.91458E+00	1.18405E-01	1.05133E-02	0.0	1.07690E-01
39	2.66282E+00	0.0	0.0	-2.55028E+00	1.12541E-01	1.25723E-02	0.0	9.99640E-02
40	2.95841E+00	0.0	0.0	-2.81874E+00	1.39666E-01	2.15026E-02	0.0	1.18162E-01
41	2.19400E+00	0.0	0.0	-2.06692E+00	1.27083E-01	2.59710E-02	0.0	1.01111E-01
42	1.07786E+00	0.0	0.0	-9.89760E-01	8.81002E-02	1.94996E-02	0.0	6.86000E-02
43	5.97373E-01	0.0	0.0	-5.24471E-01	7.29021E-02	1.54594E-02	0.0	5.74425E-02
44	1.06673E-01	0.0	0.0	-8.36626E-02	2.30104E-02	3.70796E-03	0.0	1.93025E-02
45	0.0	0.0	0.0	-0.0	0.0	0.0	0.0	0.0
SUM	3.54673E+01	0.0	0.0	-3.40202E+01	1.44707E+00	1.43523E-01	8.41619E-04	1.30266E+00

Configuration : HARMONIE with Blanket

Position 1 : Y = 73 cm from the center of the core

Position 3 : Y = 173 cm

- APPENDIX 1 -

APPENDIX 1 (Follows)

GENERAL INVENTORY BY GROUPS IN WHOLE SYSTEM Na/Cal Pos 3/Pos 6 - Sensitivity to sigma Na

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GRP.     SIGTOT       NUSIGF       DELCHI        SIGSCT         SUH          UABSOR        VINELS        VELAST

  1   2.98760E-05   0.0          0.0         -2.74033E-05   2.47269E-06   1.81312E-06   3.97747E-07   2.61794E-07
  2   5.11122E-04   0.0          0.0         -4.77131E-04   3.39912E-05   1.34439E-06   2.06538E-05   1.19922E-05
  3   1.74299E-03   0.0          0.0         -1.66305E-03   7.99410E-05   1.21549E-07   3.71018E-05   4.27165E-05
  4   2.45478E-03   0.0          0.0         -2.34637E-03   1.08408E-04   1.83713E-07   3.76906E-05   7.05321E-05
  5   3.10958E-03   0.0          0.0         -2.96116E-03   1.48414E-04   2.50090E-07   3.44752E-05   1.13687E-04
  6   1.02106E-02   0.0          0.0         -9.93711E-03   2.73481E-04   6.44459E-07   6.45239E-05   2.08311E-04
  7   5.13155E-03   0.0          0.0         -5.07920E-03   5.23552E-05   2.53884E-07   1.63910E-05   3.57106E-05
  8   4.66334E-03   0.0          0.0         -4.50880E-03   7.45468E-05   3.72022E-07   1.38855E-05   6.02901E-05
  9   3.64207E-03   0.0          0.0         -3.43713E-03   2.04942E-04   4.47700E-07   3.84258E-06   2.00651E-04
 10   1.02128E-02   0.0          0.0         -9.85603E-03   3.56786E-04   8.39593E-07   3.56160E-06   3.52379E-04
 11   1.31125E-02   0.0          0.0         -1.27350E-02   3.76631E-04   1.31291E-06   0.0           3.75316E-04
 12   7.78624E-03   0.0          0.0         -7.51477E-03   2.71469E-04   1.48709E-06   0.0           2.69979E-04
 13   2.97542E-03   0.0          0.0         -2.79714E-03   1.78271E-04   7.81276E-07   0.0           1.77568E-04
 14   6.04720E-03   0.0          0.0         -7.61981E-03   4.27399E-04   2.01220E-06   0.0           4.25383E-04
 15   2.32139E-02   0.0          0.0         -2.27278E-02   4.86102E-04   3.72217E-06   0.0           4.82362E-04
 16   2.50330E-02   0.0          0.0         -2.43990E-02   6.33202E-04   4.93855E-06   0.0           6.28259E-04
 17   3.20830E-02   0.0          0.0         -3.08425E-02   1.24050E-03   6.61422E-06   0.0           1.23357E-03
 18   6.33372E-02   0.0          0.0         -6.10247E-02   2.31249E-03   4.38145E-05   0.0           2.26862E-03
 19   1.03786E-01   0.0          0.0         -9.98768E-02   3.90953E-03   6.24888E-06   0.0           3.90321E-03
 20   6.28536E-02   0.0          0.0         -6.04087E-02   2.44493E-03   4.18845E-06   0.0           2.44070E-03
 21   2.30269E-01   0.0          0.0         -2.24241E-01   6.02810E-03   6.07177E-05   0.0           5.96738E-03
 22   2.93236E-01   0.0          0.0         -2.82582E-01   1.06543E-02   2.14027E-04   0.0           1.04401E-02
 23   3.64149E-02   0.0          0.0         -3.50692E-02   1.34568E-03   2.08525E-06   0.0           1.34359E-03
 24   9.50674E-02   0.0          0.0         -9.15617E-02   3.50571E-03   5.40102E-06   0.0           3.50028E-03
 25   3.44472E-01   0.0          0.0         -3.32814E-01   1.16582E-02   1.97540E-05   0.0           1.16383E-02
 26   5.60903E-01   0.0          0.0         -5.45270E-01   1.56331E-02   3.57397E-05   0.0           1.55971E-02
 27   6.14568E-01   0.0          0.0         -6.04919E-01   9.64820E-03   1.35969E-04   0.0           9.51201E-03
 28   6.23116E-01   0.0          0.0         -6.22425E-01   6.90699E-04   2.60712E-04   0.0           4.21882E-04
 29   1.25453E-01   0.0          0.0         -1.25504E-01  -5.12004E-05   1.10919E-04   0.0          -1.62184E-04
 30   1.25818E-01   0.0          0.0         -1.25809E-01   9.00030E-06   1.39862E-04   0.0          -1.30951E-04
 31   3.72769E-01   0.0          0.0         -3.73127E-01  -3.57807E-04   6.06487E-04   0.0          -9.64403E-04
 32   7.00506E-01   0.0          0.0         -6.89288E-01   1.12174E-02   1.65613E-03   0.0           9.56088E-03
 33   9.68442E-01   0.0          0.0         -9.25515E-01   4.29263E-02   2.30121E-03   0.0           4.06249E-02
 34   1.27939E+00   0.0          0.0         -1.20916E+00   7.02276E-02   3.03481E-03   0.0           6.71921E-02
 35   1.72320E+00   0.0          0.0         -1.62802E+00   9.51062E-02   4.27529E-03   0.0           9.09100E-02
 36   2.18842E+00   0.0          0.0         -2.05956E+00   1.28860E-01   5.76766E-03   0.0           1.23092E-01
 37   2.64534E+00   0.0          0.0         -2.48077E+00   1.64567E-01   7.71129E-03   0.0           1.56855E-01
 38   4.84992E+00   0.0          0.0         -4.55110E+00   2.98820E-01   1.68114E-02   0.0           2.82006E-01
 39   5.50052E+00   0.0          0.0         -5.13104E+00   3.69478E-01   2.59703E-02   0.0           3.43504E-01
 40   7.90431E+00   0.0          0.0         -7.33313E+00   5.71185E-01   5.74508E-02   0.0           5.13731E-01
 41   7.06584E+00   0.0          0.0         -6.43779E+00   6.28049E-01   8.36403E-02   0.0           5.44406E-01
 42   3.67450E+00   0.0          0.0         -3.22232E+00   4.52188E-01   6.64755E-02   0.0           3.85708E-01
 43   2.11235E+00   0.0          0.0         -1.75848E+00   3.53901E-01   5.46654E-02   0.0           2.99234E-01
 44   3.58755E-01   0.0          0.0         -2.62200E-01   9.65554E-02   1.24703E-02   0.0           8.40848E-02
 45   0.0           0.0          0.0          0.0           0.0           0.0           0.0           0.0

SUM   4.47775E+01   0.0          0.0         -4.14219E+01   3.35553E+00   3.43911E-01   2.32524E-04   3.01137E+00
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HARMONIC WITH BLANKET

Position 3. Y = 173 cm from the center of the core

Position 6 : Y = 323 cm " " " " "

CEN/CA

GENERAL INVENTORY BY GROUPS IN WHOLE SYSTEM Na/Cd Pos 1/Pos 3 Sensitivity to σ Na

GRP.	SIGTOT	NUSIGF	DELCHI	SIGSCT	SUM	UABSOR	UINELS	UELAST
1	2.82156E-06	0.0	0.0	-2.62333E-06	1.98229E-07	1.71236E-07	3.39181E-09	2.35986E-08
2	3.11594E-05	0.0	0.0	-2.93704E-05	1.78906E-06	8.19578E-08	1.01964E-06	6.87431E-07
3	1.61627E-04	0.0	0.0	-1.53991E-04	7.63647E-06	1.12712E-08	3.31624E-06	4.30886E-06
4	3.88927E-04	0.0	0.0	-3.69794E-04	1.91333E-05	2.91069E-08	6.02606E-06	1.30780E-05
5	5.83331E-04	0.0	0.0	-5.54673E-04	2.86582E-05	4.70648E-08	6.38075E-06	2.22301E-05
6	8.64667E-03	0.0	0.0	-8.21425E-03	4.32428E-04	5.45749E-07	9.12389E-05	3.40642E-04
7	5.28928E-03	0.0	0.0	-5.16175E-03	1.27528E-04	2.61687E-07	2.36174E-05	1.03648E-04
8	9.93234E-03	0.0	0.0	-9.40468E-03	5.27658E-04	7.92361E-07	5.06184E-05	4.76246E-04
9	1.29238E-02	0.0	0.0	-1.17637E-02	1.16017E-03	1.58866E-06	1.94991E-05	1.13907E-03
10	4.38835E-02	0.0	0.0	-4.16003E-02	2.28322E-03	3.60765E-06	2.13613E-05	2.25824E-03
11	6.48167E-02	0.0	0.0	-6.19260E-02	2.89067E-03	6.48991E-06	0.0	2.88414E-03
12	4.23223E-02	0.0	0.0	-4.00760E-02	2.24624E-03	8.08309E-06	0.0	2.23815E-03
13	1.31807E-02	0.0	0.0	-1.23421E-02	8.38555E-04	3.10656E-06	0.0	8.35434E-04
14	4.46433E-02	0.0	0.0	-4.17139E-02	2.92932E-03	1.11631E-05	0.0	2.91814E-03
15	1.39567E-01	0.0	0.0	-1.35046E-01	4.52071E-03	2.23784E-05	0.0	4.49830E-03
16	1.62378E-01	0.0	0.0	-1.56624E-01	5.75423E-03	3.20343E-05	0.0	5.72217E-03
17	2.13487E-01	0.0	0.0	-2.03110E-01	1.03770E-02	4.40124E-05	0.0	1.03330E-02
18	4.29903E-01	0.0	0.0	-4.11517E-01	1.83865E-02	2.97392E-04	0.0	1.80890E-02
19	6.09481E-01	0.0	0.0	-5.85094E-01	2.43863E-02	3.66962E-05	0.0	2.43494E-02
20	3.36401E-01	0.0	0.0	-3.21540E-01	1.48608E-02	2.24171E-05	0.0	1.48382E-02
21	1.11728E+00	0.0	0.0	-1.08409E+00	3.31890E-02	2.94606E-04	0.0	3.28941E-02
22	1.18672E+00	0.0	0.0	-1.14430E+00	4.24175E-02	8.66157E-04	0.0	4.15511E-02
23	1.38128E-01	0.0	0.0	-1.32210E-01	5.91832E-03	7.90972E-06	0.0	5.91036E-03
24	3.55465E-01	0.0	0.0	-3.39283E-01	1.61826E-02	2.01949E-05	0.0	1.61623E-02
25	1.22289E+00	0.0	0.0	-1.17229E+00	5.05943E-02	7.01299E-05	0.0	5.05232E-02
26	1.69638E+00	0.0	0.0	-1.63364E+00	6.27241E-02	1.08090E-04	0.0	6.26158E-02
27	1.67619E+00	0.0	0.0	-1.64160E+00	3.45964E-02	3.70847E-04	0.0	3.42253E-02
28	1.60281E+00	0.0	0.0	-1.60779E+00	-4.97627E-03	6.91196E-04	0.0	-5.66882E-03
29	3.33353E-01	0.0	0.0	-3.33910E-01	-5.56580E-04	2.94734E-04	0.0	-8.51400E-04
30	3.34765E-01	0.0	0.0	-3.34925E-01	-1.59860E-04	3.72133E-04	0.0	-5.32117E-04
31	9.89708E-01	0.0	0.0	-9.94298E-01	-4.59003E-03	1.61002E-03	0.0	-6.20031E-03
32	1.78471E+00	0.0	0.0	-1.76298E+00	2.17342E-02	4.21941E-03	0.0	1.75140E-02
33	1.87691E+00	0.0	0.0	-1.81406E+00	6.28500E-02	4.45991E-03	0.0	5.83895E-02
34	1.54251E+00	0.0	0.0	-1.48809E+00	5.44147E-02	3.65895E-03	0.0	5.07547E-02
35	2.39523E+00	0.0	0.0	-2.31071E+00	8.45213E-02	5.94259E-03	0.0	7.85772E-02
36	2.27513E+00	0.0	0.0	-2.19595E+00	7.91759E-02	5.99620E-03	0.0	7.31791E-02
37	2.16685E+00	0.0	0.0	-2.09007E+00	7.67841E-02	6.31648E-03	0.0	7.04672E-02
38	3.07300E+00	0.0	0.0	-2.95866E+00	1.14340E-01	1.06520E-02	0.0	1.03686E-01
39	2.73001E+00	0.0	0.0	-2.61143E+00	1.18581E-01	1.28895E-02	0.0	1.05689E-01
40	3.06836E+00	0.0	0.0	-2.90895E+00	1.59409E-01	2.23017E-02	0.0	1.37106E-01
41	2.27382E+00	0.0	0.0	-2.11963E+00	1.54191E-01	2.69159E-02	0.0	1.27274E-01
42	1.10097E+00	0.0	0.0	-9.96104E-01	1.04869E-01	1.99177E-02	0.0	8.49520E-02
43	6.08752E-01	0.0	0.0	-5.26425E-01	8.23269E-02	1.57539E-02	0.0	6.65727E-02
44	1.07969E-01	0.0	0.0	-8.33570E-02	2.46110E-02	3.75300E-03	0.0	2.08580E-02
45	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SUM	3.77958E+01	0.0	0.0	-3.63309E+01	1.46498E+00	1.47974E-01	2.23081E-04	1.31671E+00

Harmonie Without Blanket

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GENERAL INVENTORY BY GROUPS IN WHOLE SYSTEM

GRP.   SIGTOT        NUSIGF     DELCHI     SIGSCT         SUM            UABSOR         UINELS         UELAST

  1    6.62221E-07   0.0        0.0        -6.25475E-07   5.63460E-08    4.14028E-08    8.99581E-09    5.94707E-09
  2    7.32406E-06   0.0        0.0        -6.84686E-06   4.77195E-07    1.92643E-08    2.89582E-07    1.68344E-07
  3    3.36543E-05   0.0        0.0        -3.20502E-05   1.60412E-06    2.34692E-09    7.44048E-07    8.57704E-07
  4    6.15924E-05   0.0        0.0        -5.85373E-05   3.05506E-06    4.60952E-09    1.06134E-06    1.98907E-06
  5    1.02377E-04   0.0        0.0        -9.67059E-05   5.67062E-06    8.26005E-09    1.31644E-06    4.34606E-06
  6    5.38737E-04   0.0        0.0        -5.10779E-04   1.99580E-05    3.40033E-08    4.69036E-06    1.52336E-05
  7    2.83462E-04   0.0        0.0        -2.79562E-04   3.90015E-06    1.40243E-08    1.17623E-06    2.70968E-06
  8    2.83391E-04   0.0        0.0        -2.76945E-04   6.44615E-06    2.26078E-08    1.09112E-06    5.33252E-06
  9    5.04752E-04   0.0        0.0        -4.55001E-04   4.97506E-05    6.20464E-08    7.53571E-07    4.89347E-05
 10    2.06925E-03   0.0        0.0        -1.95489E-03   1.14355E-04    1.70112E-07    9.61238E-07    1.13223E-04
 11    3.37534E-03   0.0        0.0        -3.22942E-03   1.45915E-04    3.37963E-07    0.0            1.45576E-04
 12    2.33935E-03   0.0        0.0        -2.21025E-03   1.21097E-04    4.46790E-07    0.0            1.20650E-04
 13    1.04714E-03   0.0        0.0        -9.56695E-04   9.04491E-05    2.46802E-07    0.0            9.02016E-05
 14    3.15849E-03   0.0        0.0        -2.91304E-03   2.45451E-04    7.89780E-07    0.0            2.44660E-04
 15    9.41122E-03   0.0        0.0        -9.13733E-03   2.73895E-04    1.50901E-06    0.0            2.72362E-04
 16    1.13803E-02   0.0        0.0        -1.09842E-02   3.96125E-04    2.24513E-06    0.0            3.93875E-04
 17    1.77232E-02   0.0        0.0        -1.67977E-02   9.25504E-04    3.65380E-06    0.0            9.21839E-04
 18    4.30046E-02   0.0        0.0        -4.09678E-02   2.01682E-03    2.97491E-05    0.0            1.96705E-03
 19    8.34351E-02   0.0        0.0        -7.96124E-02   3.82274E-03    5.02355E-06    0.0            3.81768E-03
 20    5.32832E-02   0.0        0.0        -5.08132E-02   2.47004E-03    3.55070E-06    0.0            2.46648E-03
 21    2.12384E-01   0.0        0.0        -2.05981E-01   6.40285E-03    5.60017E-05    0.0            6.34676E-03
 22    2.90670E-01   0.0        0.0        -2.78974E-01   1.16960E-02    2.12153E-04    0.0            1.14837E-02
 23    3.63810E-02   0.0        0.0        -3.49002E-02   1.48083E-03    2.08331E-06    0.0            1.47874E-03
 24    9.56757E-02   0.0        0.0        -9.18047E-02   3.87096E-03    5.43558E-06    0.0            3.86540E-03
 25    3.55783E-01   0.0        0.0        -3.42845E-01   1.29376E-02    2.04034E-05    0.0            1.29170E-02
 26    5.89440E-01   0.0        0.0        -5.71142E-01   1.72977E-02    3.74943E-05    0.0            1.72600E-02
 27    6.47496E-01   0.0        0.0        -6.36977E-01   1.06180E-02    1.43254E-04    0.0            1.04753E-02
 28    6.56165E-01   0.0        0.0        -6.55498E-01   6.67155E-04    2.82964E-04    0.0            3.84033E-04
 29    1.32238E-01   0.0        0.0        -1.32295E-01  -5.66040E-05    1.16918E-04    0.0           -1.73628E-04
 30    1.32625E-01   0.0        0.0        -1.32616E-01   9.65595E-06    1.47430E-04    0.0           -1.37866E-04
 31    3.92945E-01   0.0        0.0        -3.93339E-01  -3.93927E-04    6.39228E-04    0.0           -1.03337E-03
 32    7.43497E-01   0.0        0.0        -7.31220E-01   1.22770E-02    1.75777E-03    0.0            1.05190E-02
 33    1.03086E+00   0.0        0.0        -9.84651E-01   4.62075E-02    2.44953E-03    0.0            4.37576E-02
 34    1.35393E+00   0.0        0.0        -1.27961E+00   7.42197E-02    3.21139E-03    0.0            7.10077E-02
 35    1.79833E+00   0.0        0.0        -1.70055E+00   9.77716E-02    4.46166E-03    0.0            9.33084E-02
 36    2.25497E+00   0.0        0.0        -2.12489E+00   1.30082E-01    5.94306E-03    0.0            1.24139E-01
 37    2.69767E+00   0.0        0.0        -2.53379E+00   1.63879E-01    7.86383E-03    0.0            1.56014E-01
 38    4.89204E+00   0.0        0.0        -4.59687E+00   2.95172E-01    1.69574E-02    0.0            2.78210E-01
 39    5.51073E+00   0.0        0.0        -5.14709E+00   3.63635E-01    2.60185E-02    0.0            3.37613E-01
 40    7.88945E+00   0.0        0.0        -7.32512E+00   5.64333E-01    5.73428E-02    0.0            5.06987E-01
 41    7.04555E+00   0.0        0.0        -6.42117E+00   6.24376E-01    8.34001E-02    0.0            5.40975E-01
 42    3.66001E+00   0.0        0.0        -3.20908E+00   4.50936E-01    6.62133E-02    0.0            3.84721E-01
 43    2.10033E+00   0.0        0.0        -1.74701E+00   3.53324E-01    5.43545E-02    0.0            2.98968E-01
 44    3.55900E-01   0.0        0.0        -2.59684E-01   9.62169E-02    1.23711E-02    0.0            8.38456E-02
 45    0.0           0.0        0.0         0.0           0.0            0.0            0.0            0.0

SUM    4.51060E+01   0.0        0.0        -4.17583E+01   3.34770E+00    3.44056E-01    1.20929E-05    3.00358E+00
```

Na/Cd Pos 3/Pos 6 Sensitivity to σ Na

Harmonie with Blanket

APPENDIX I (Follows)

- APPENDIX 2 -

DETECTORS CROSS-SECTIONS

(These cross-sections take into account the Cd corrrections at low energies)

Group	Sulfur (n,p)	Rhodium (n,n')	Mn/Cd(n,γ) e* =0.02cm	Mn/Cd(n,γ) e* =0.05cm	Na/Cd(n,γ) e* =0.25cm
1	0.330	1.34	0.0	0.0	0.0
2	0.270	1.13	0.0	0.0	0.0
3	0.115	1.00	9.39 10^{-5}	9.406 10^{-5}	4.900 10^{-4}
4	0.0119	0.840	1.237 10^{-4}	1.244 10^{-4}	6.006
5	5.50 10^{-4}	0.715	1.442	1.453	6.38
6	3.55 10^{-5}	0.653	1.726	1.724	7.035
7		0.472	2.049	2.051	9.55
8		0.237	2.351	2.352	1.060 10^{-3}
9		0.154	2.595	2.616	9.20 10^{-4}
10		0.130	2.846	2.866	7.83
11		0.109	3.408	3.428	1.125 10^{-3}
12		9.58 10^{-2}	3.901	3.922	1.935
13		8.84	4.108	4.144	2.148
14		8.32	4.343	4.366	2.130
15		6.71	5.050	5.079	2.124
16		4.22	6.624	6.688	2.490
17		2.51	8.153	8.016	2.120
18		1.76	9.721	9.802	7.40 10^{-3}
19		2.71 10^{-3}	1.241 10^{-3}	1.251 10^{-3}	6.670 10^{-4}
20			1.457	1.465	7.957
21			1.864	1.876	3.626 10^{-3}
22			3.421	3.486	8.150
23			2.969	2.986	6.905 10^{-4}
24			3.745	3.764	6.940
25			5.185	5.179	7.340
26			5.092	5.144	9.38
27			4.439	4.286	4.50 10^{-3}
28			6.580	7.595	3.800 10^{-2}
29			3.337	4.278	2.017 10^{-1}
30			8.097	1.038 10^{-2}	7.071

(Continued)

Group	Sulfur (n,p)	Rhodium (n,n')	Mn/Cd(n,γ) e* =0.02cm	Mn/Cd(n,γ) e* =0.05cm	Na/Cd(n,γ) e* =0.25cm
31			3.182 10^{-2}	2.916	1.78
32			7.427 10^{-3}	7.793 10^{-3}	4.50 10^{-2}
33			6.316 10^{-2}	6.182 10^{-2}	2.676
34			2.172	2.728	2.397
35			5.854 10^{-1}	6.220 10^{-1}	2.459
36			6.871 10^{-2}	6.502 10^{-2}	2.590 10^{-2}
37			2.704	2.690	2.835
38			2.334	2.352	3.380
39			2.720	2.764	4.600
40			3.811	3.915	7.150
41			6.009	6.153	1.170 10^{-1}
42			9.008	9.298	1.80
43			1.204 10^{-1}	1.219 10^{-1}	2.380
44			8.670 10^{-2}	8.797 10^{-2}	1.717
45			0.0	0.0	0.0

APPENDIX 2(bis)

DETECTORS CROSS-SECTIONS

Group Number	Au/Cd	Group Number	
1	$1.253\ 10^{-2}$	24	6.762
2	1.646	25	7.836
3	3.556	26	$1.075\ 10^{0}$
4	6.091	27	1.584
5	7.273	28	2.154
6	8.377	29	2.783
7	$1.004\ 10^{-1}$	30	3.028
8	1.199	31	3.743
9	1.350	32	5.185
10	1.503	33	7.973
11	1.783	34	8.267
12	2.011	35	9.940
13	2.090	36	6.070
14	2.148	37	$1.063\ 10^{1}$
15	2.304	38	1.545
16	2.571	39	$4.381\ 10^{-1}$
17	2.749	40	$2.313\ 10^{0}$
18	2.962	41	$3.054\ 10^{2}$
19	3.110	42	$3.523\ 10^{1}$
20	3.649	43	2.211
21	4.408	44	1.279
22	5.617	45	0.
23	$6.460\ 10^{-1}$		

- APPENDIX 3 -

ANISN INPUT - 45 GROUP HARMONIE

```
15$$
3 0 3  4 3 0   0 5 74 0 45 5    6 50 64 8 20 44    0 0 0 0 0 200
0 0 0 0 1 0   0 0 3 1 1 0

16**
0.  0.  0.00001  0.  0.  0.  0.  0.  0.  0.5  0.00001  0.  0.  0.
  T
18**   (SEE IN THE ANNEX 4 )
 3**
74R 1.    3256Z
  T
 1**
45R   0.
 4**
* 53.6   53.61   55.0   56.4   57I 60.5   350.5   353.6 9I  354.6  384.
 5**
45R   1.
 6*
         0.0       0.1734      0.32657 2N
 7*
        -1.0     -0.86113     -0.33998 2M
 8$$
 1   21R 2   41R 3     4       10R 5
 9$$
29 29 33 37 41
19$$
   5R 3
```

* *The one-dimensional neutron source comes from the DOT R,Z calculation at the position 53.6 cm from the center of the core. It is averaged on several radial meshes. This source is introduced on the same position in the one-dimensional calculation.*

```
HARMONIE WITHOUT BLANKET
  3R 0.0    3.1081E-11  1.3427E-10 3R 0.0    3.2612E-10  7.2453E-10
  3R 0.0    1.4075E-09  2.1066E-09 3R 0.0    3.3754E-09  4.3604E-09
  3R 0.0    4.0804E-09  4.7725E-09 3R 0.0    9.7447E-08  9.8472E-08
  3R 0.0    7.2795E-08  6.5192E-08 3R 0.0    2.4638E-07  2.3241E-07
  3R 0.0    1.2747E-07  1.0313E-07 3R 0.0    2.7306E-07  2.0404E-07
  3R 0.0    4.3677E-07  3.4837E-07 3R 0.0    3.0049E-07  2.4960E-07
  3R 0.0    1.0445E-07  9.4964E-08 3R 0.0    1.9707E-07  1.4079E-07
  3R 0.0    7.1645E-07  5.4520E-07 3R 0.0    5.3562E-07  3.6808E-07
  3R 0.0    7.2052E-07  5.1546E-07 3R 0.0    1.6593E-06  1.2177E-06
  3R 0.0    1.2101E-06  8.0230E-07 3R 0.0    8.6772E-07  5.8875E-07
  3R 0.0    2.1076E-06  1.4190E-06 3R 0.0    1.1941E-06  7.3030E-07
  3R 0.0    4.8895E-07  3.6464E-07 3R 0.0    1.0556E-06  7.8007E-07
  3R 0.0    1.5745E-06  1.0080E-06 3R 0.0    1.7726E-06  1.1173E-06
  3R 0.0    9.4731E-07  5.6889E-07 3R 0.0    9.5074E-07  5.9584E-07
  3R 0.0    1.9561E-07  1.2963E-07 3R 0.0    1.5701E-07  1.0644E-07
  3R 0.0    3.1068E-07  2.0299E-07 3R 0.0    1.2003E-06  7.4600E-07
  3R 0.0    1.1867E-06  7.0737E-07 3R 0.0    1.0627E-06  6.5566E-07
  3R 0.0    8.7647E-07  5.0304E-07 3R 0.0    9.9952E-07  5.9270E-07
  3R 0.0    9.3097E-07  5.5764E-07 3R 0.0    1.2245E-06  7.3637E-07
  3R 0.0    1.0490E-06  6.3154E-07 3R 0.0    1.0784E-06  6.4678E-07
  3R 0.0    7.2427E-07  4.3036E-07 3R 0.0    3.3646E-07  1.9666E-07
  3R 0.0    1.8530E-07  1.0534E-07 3R 0.0    7.2556E-08  4.0559E-08
  3R 0.0    2.8249E-08  1.4699E-08


HARMONIE WITH BLANKET
  3R 0.0    2.5283E-09  2.8637E-09 3R 0.0    3.0792E-08  2.9291E-08
  3R 0.0    6.8462E-08  6.1252E-08 3R 0.0    5.3229E-08  5.1135E-08
  3R 0.0    4.9963E-08  4.2494E-08 3R 0.0    1.6046E-07  1.5520E-07
  3R 0.0    1.2453E-07  1.0541E-07 3R 0.0    2.0987E-07  1.9063E-07
  3R 0.0    1.3862E-07  1.1844E-07 3R 0.0    2.0970E-07  1.5073E-07
  3R 0.0    2.8101E-07  2.1940E-07 3R 0.0    1.8072E-07  1.4612E-07
  3R 0.0    5.2763E-08  4.4408E-08 3R 0.0    1.5588E-07  1.2366E-07
  3R 0.0    5.1330E-07  4.0451E-07 3R 0.0    5.0654E-07  3.7973E-07
  3R 0.0    6.4801E-07  4.9008E-07 3R 0.0    1.2021E-06  8.8613E-07
  3R 0.0    1.2745E-06  9.0390E-07 3R 0.0    8.7091E-07  6.0956E-07
  3R 0.0    2.2837E-06  1.5914E-06 3R 0.0    2.0119E-06  1.3309E-06
  3R 0.0    3.7768E-07  2.6279E-07 3R 0.0    7.7165E-07  5.4214E-07
  3R 0.0    1.9743E-06  1.3330E-06 3R 0.0    2.2594E-06  1.4829E-06
  3R 0.0    1.5310E-06  9.7294E-07 3R 0.0    1.0344E-06  6.4221E-07
  3R 0.0    9.7424E-08  6.0320E-08 3R 0.0    5.9569E-08  3.8034E-08
  3R 0.0    3.1486E-07  2.0319E-07 3R 0.0    1.2993E-06  8.1633E-07
  3R 0.0    1.3863E-06  8.4513E-07 3R 0.0    1.1695E-06  7.2530E-07
  3R 0.0    1.0853E-06  6.4425E-07 3R 0.0    9.5740E-07  5.5607E-07
  3R 0.0    8.1284E-07  4.7136E-07 3R 0.0    9.3703E-07  5.3912E-07

  3R 0.0    6.8620E-07  3.8865E-07 3R 0.0    6.7524E-07  3.8270E-07
  3R 0.0    3.5299E-07  1.9351E-07 3R 0.0    1.9692E-07  1.0916E-07
  3R 0.0    1.2572E-07  6.9926E-08 3R 0.0    5.2835E-08  2.93[illegible]
  3R 0.0    2.1695E-09  1.1344E-09
```

- APPENDIX 4 -

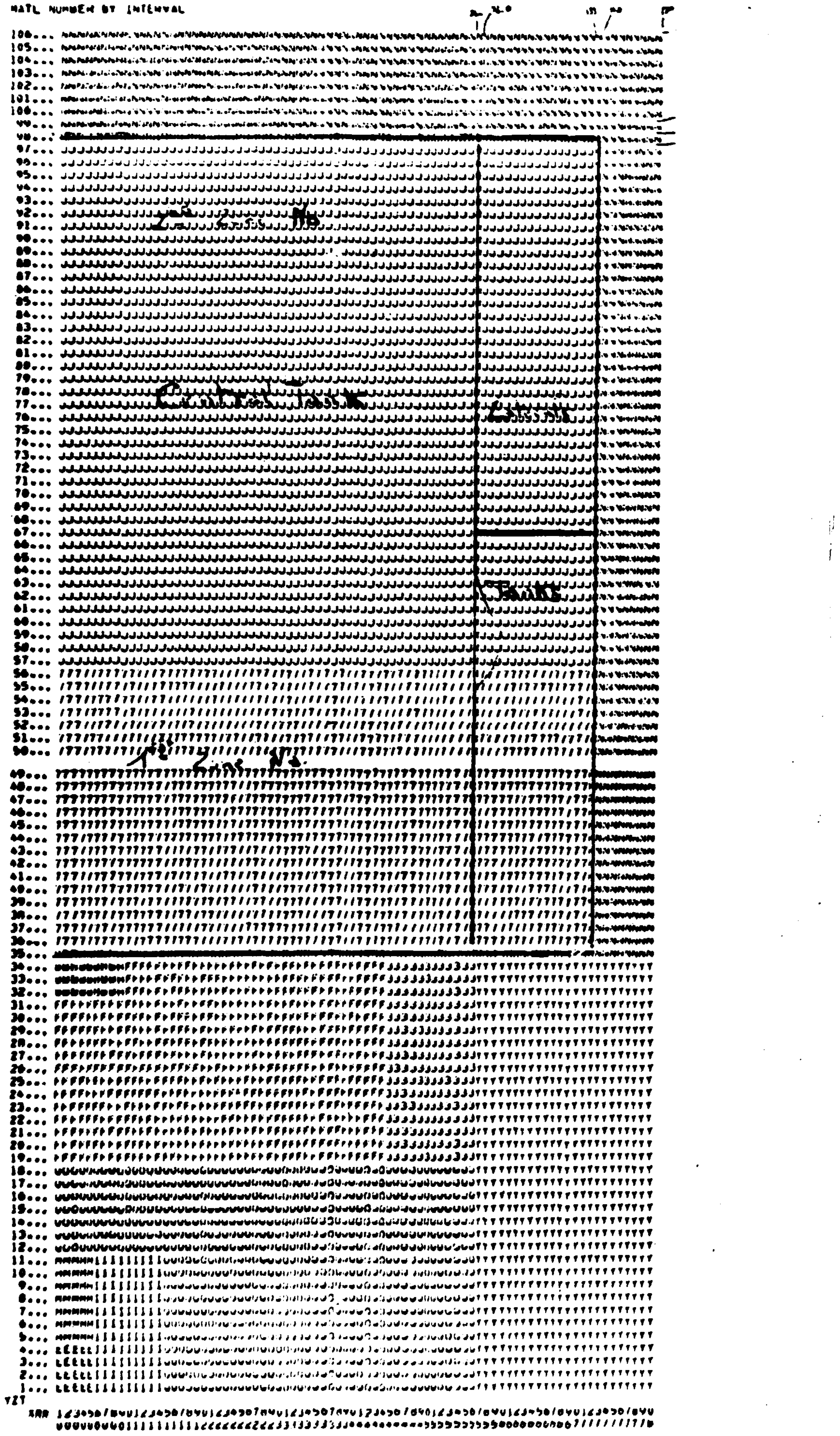
SHELL SOURCES

DOT Schematization

E = Core
I = Radial blanket
M = Axial blanket
Q = Reflector
Y = concrete
F = Stainless-steel
or Blanket
B = Aluminum
Channel 0
N = Wood
R = Steel tank

3 = Relfector
7 = Na zone 1
5 = Na zone 2

MATL NUMBER BY INTERVAL



```
SYMBOL =  1  2  3  4  5  6  7  8  9  A  B  C  D  E  F  G  H  I  J  K  L  M  N  O  P  Q  R  S  T  U  V  W  X  Y
NUMBER =  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34
NUMBER = 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
NUMBER = 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97
```

- APPENDIX 5 -

- APPENDIX 6 -

```
HARMONIC WITHOUT BLANKET
61$$
 0 3 13 80 106 45 5 6 50 104 0 48 100 0 16 1 1 0 1 0 1 100 100 3 0 2 3R0
 11 4R0 5 3R0 35 0 3 0 13 7R0 2 1 1 8R0
62$$
10 12 11 30 3 13 4 20-21 27 8 60000 0 0
63**
1.0 0.5E-04 0.1E-02 0.25E+03 14R0.0
  T
 7*
D8--49500473 8--35002120 8-+35002120 8--93674178 8--86889028 8--35002120
 8-+35002120 8-+86889028
 8--49500473 8--35002120 8-+35002120 8--93674178 8--86889028 8--35002120
 8-+35002120 8-+86889028
 8--86889028 20          1 8--35002120 40          1
 8-+86889028 20          1 8-+35002120 40          1
  T
 6*
   .0         9-83333333.10          1    .0         9-83333333. 30          1
   .0         9-83333333.10          1    .0         9-83333333. 30          1
  T
13$$
 6600 6601 6602 6603 6700 6701 6702 6703 100 101 102 103 200 201 202 203
 300 301 302 303 2000 2001 2002 2003 1100 1101 1102 1103 800 801 802 803
 2100 2101 2102 2103.400 401 402 403 6900 6901 6902 6903 6800 6801 6802
 6803
  T
3**
45R1.0
  T
1**
 45R0.0
2**
 3I 0.0 6I 5.7 5I 16.0 24.2 12I 26.0 2I 46.0 51.0 51.6 51.7 56.3 60.9
 16I 65.5 9I 150.5 200.5 202.5 2I 205.5 350.5    351.5
 353.5 356.5 4I 360.0 380.0
4**
 4I 0.0 6.2 3I 7.4 3I 12.39 23I 16.5 50.447 10I 51.8 74.4      76.0
 78.0 81.0 11I 85.0 139.0 140.0 142.0 145.0 4I 149.0 170.0
5**
 45R1.0
8$$
 5R1 9R2 42R4 24R6 33R0
5R3 9R2 42R4 24R6 53R0
 5R4 1R5 50R4 24R6 53R0
56R4 24R6 44R10 12R7 24R6 120R0
 9R9 35R10 12R7 24R6 20R0
 72R13 8R12
 55R8 1R13 15R8 1R13 8R12 200R0
 55R11 1R13 15R11 1R13 8R12 90R0
 55R11 17R13 8R12
 55R11 1R13 15R11 1R13 8R12 292R0
 72R13 8R12
 80R12 70R0
 9$$
 -49 -53 -57 -61 -65 -69 -73 -77 -81 -85 -89 -93 -97
10$$
 2R49 2R50 2R51 2R52 2R53 2R54 2R55 2R56 2R57 2R58 2R59 2R60 2R61 2R62
 2R63 2R64 2R65 2R66 2R67 2R68 2R69 2R70 2R71 2R72 2R73 2R74 2R75 2R76
 2R77 2R78 2R79 2R80 2R81 2R82 2R83 2R84 2R85 2R86 2R87 2R88 2R89 2R90
 2R91 2R92 2R93 2R94 2R95 2R96 2R97 2R98 2R99 2R100
11$$


 0 9 0 10 0 11 0 12 0 13 0 14 0 15 0 16 0 17 0 18 0 19 0 20 0 21 0 22
 0 23 0 24 0 25 0 26 0 27 0 28 0 29 0 30 0 31 0 32 0 33 0 34 0 35 0 36
 0 1 0 2 0 3 0 4 0 25 0 26 0 27 0 28 0 33 0 34 0 35 0 36 0 5 0 6 0 7 0
 0 41 0 42 0 43 0 44 0 45 0 46 0 47 0 48
12**
 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0
 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0
 0.0 1.0000E-24 0.0 1.0000E-24 0.0 1.0000E-24 0.0 1.0000E-24
 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0
 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0
 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0
 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0 0.0 1.0
30$$
 1 2 3 4 5 6 7 8 9 10 11 12 13
32$$
 1 2 3 4 5 7 8 9 10 11 13
```

```
                    FISSION UNIT

XHR     YZT  1       YZT  2       YZT  3       YZT  4       YZT  5       YZT  6       YZT  7       YZT  8
  1  1.73961E-03  1.67414E-03  1.53628E-03  1.28033E-03  9.76679E-05  6.10917E-05  3.96575E-05  2.67621E-05
  2  1.67912E-03  1.61565E-03  1.48018E-03  1.23993E-03  9.29671E-05  5.78222E-05  3.76461E-05  2.53460E-05
  3  1.56659E-03  1.50497E-03  1.37915E-03  1.15246E-03  8.50526E-05  5.23490E-05  3.39419E-05  2.28361E-05
  4  1.40359E-03  1.34994E-03  1.23979E-03  1.05472E-03  7.32463E-05  4.47850E-05  2.92773E-05  2.01303E-05
  5  1.17806E-03  1.13457E-03  1.04929E-03  9.09482E-04  5.78748E-05  3.68272E-05  2.52182E-05  1.77484E-05
  6  7.81855E-05  7.43614E-05  6.57258E-05  5.21276E-05  3.74274E-05  2.66672E-05  1.88964E-05  1.36315E-05
  7  5.00419E-05  4.75928E-05  4.18799E-05  3.47448E-05  2.80387E-05  2.13683E-05  1.58656E-05  1.17645E-05
  8  3.48850E-05  3.30542E-05  2.96921E-05  2.55400E-05  2.12262E-05  1.64518E-05  1.29955E-05  9.94772E-06
  9  2.53091E-05  2.40145E-05  2.17630E-05  1.90642E-05  1.63238E-05  1.33109E-05  1.05173E-05  8.24811E-06
 10  1.84806E-05  1.75790E-05  1.59444E-05  1.43131E-05  1.24960E-05  1.04534E-05  8.44168E-06  6.73316E-06
 11  1.34097E-05  1.27603E-05  1.18711E-05  1.07248E-05  9.54597E-06  8.17279E-06  6.76622E-06  5.50027E-06
 12  9.85010E-06  9.47501E-06  8.88558E-06  8.20432E-06  7.37955E-06  6.45693E-06  5.46542E-06  4.53766E-06
 13  7.36952E-06  7.16395E-06  6.79242E-06  6.34917E-06  5.80214E-06  5.14610E-06  4.46270E-06  3.78147E-06
 14  5.64073E-06  5.51171E-06  5.30630E-06  4.99213E-06  4.61630E-06  4.17541E-06  3.60063E-06  3.19979E-06
 15  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
       XHR    16 THRU  XRR    76 SAME AS ABOVE

XHR     YZT  9       YZT 10       YZT 11       YZT 12       YZT 13       YZT 14       YZT 15       YZT 16
  1  1.84123E-05  1.27612E-05  8.36150E-06  0.0          0.0          0.0          0.0          0.0
  2  1.73626E-05  1.20704E-05  8.57505E-06  0.0          0.0          0.0          0.0          0.0
  3  1.57690E-05  1.11461E-05  8.05308E-06  0.0          0.0          0.0          0.0          0.0
  4  1.42064E-05  1.02324E-05  7.49752E-06  0.0          0.0          0.0          0.0          0.0
  5  1.27865E-05  9.35513E-06  6.90691E-06  0.0          0.0          0.0          0.0          0.0
  6  9.97474E-06  7.41092E-06  5.52628E-06  0.0          0.0          0.0          0.0          0.0
  7  8.79388E-06  6.62582E-06  5.02755E-06  0.0          0.0          0.0          0.0          0.0
  8  7.62994E-06  5.97239E-06  4.55447E-06  0.0          0.0          0.0          0.0          0.0
  9  6.48645E-06  5.12777E-06  4.08353E-06  0.0          0.0          0.0          0.0          0.0
 10  5.39426E-06  4.35693E-06  3.56150E-06  0.0          0.0          0.0          0.0          0.0
 11  4.46930E-06  3.67276E-06  3.07102E-06  0.0          0.0          0.0          0.0          0.0
 12  3.74931E-06  3.12850E-06  2.66525E-06  0.0          0.0          0.0          0.0          0.0
 13  3.18804E-06  2.70579E-06  2.34606E-06  0.0          0.0          0.0          0.0          0.0
 14  2.75251E-06  2.38656E-06  2.10905E-06  0.0          0.0          0.0          0.0          0.0
 15  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
       XPR    16 THRU  XRR    76 SAME AS ABOVE

XPR     YZT 17       YZT 18       YZT 19       YZT 20       YZT 21       YZT 22       YZT 23       YZT 24
  1  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
       XRR     2 THRU  XRR    76 SAME AS ABOVE

XRR     YZT 25       YZT 26       YZT 27       YZT 28       YZT 29       YZT 30       YZT 31       YZT 32
  1  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
       XRR     2 THRU  XRR    76 SAME AS ABOVE

XRR     YZT 33       YZT 34       YZT 35       YZT 36       YZT 37       YZT 38       YZT 39       YZT 40
  1  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
       XRR     2 THRU  XRR    76 SAME AS ABOVE

XRR     YZT 41       YZT 42       YZT 43       YZT 44       YZT 45       YZT 46       YZT 47       YZT 48
  1  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
       XRR     2 THRU  XRR    76 SAME AS ABOVE

XRR     YZT 49       YZT 50       YZT 51
  1  0.0          0.0          0.0
       XRR     2 THRU  XRR    76 SAME AS ABOVE
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Harwell

~~[illegible] [illegible]~~
without blanket

Fission Source in
the core and the
blanket

APPENDIX 7

Appendix 7bis

Hurrah

With Blanket on
the core, the blanket
and the UO2 Na [illegible]

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                FISSION EDIT

XRR    YZT  1       YZT  2       YZT  3       YZT  4       YZT  5       YZT  6       YZT  7       YZT  8
  1  1.71091E-03  1.65475E-03  1.51575E-03  1.26347E-03  9.64697E-05  6.03224E-05  3.91370E-05  2.61101E-05
  2  1.65902E-03  1.59657E-03  1.46250E-03  1.22175E-03  8.10172E-05  5.70049E-05  3.71470E-05  2.49056E-05
  3  1.54739E-03  1.49479E-03  1.38134E-03  1.14990E-03  6.39853E-05  5.17155E-05  3.34800E-05  2.25052E-05
  4  1.30539E-03  1.33313E-03  1.22370E-03  1.04020E-03  7.24000E-05  4.42001E-05  2.88764E-05  1.90312E-05
  5  1.16293E-03  1.11757E-03  1.09503E-03  8.95139E-04  5.71240E-05  3.63353E-05  2.49015E-05  1.74710E-05
  6  7.72187E-05  7.36305E-05  6.64135E-05  5.14425E-05  3.64201E-05  2.62905E-05  1.86077E-05  1.34012E-05
  7  4.62931E-05  4.60260E-05  4.05024E-05  3.41089E-05  2.71244E-05  2.00571E-05  1.53733E-05  1.14073E-05
  8  3.25523E-05  3.08253E-05  2.76360E-05  2.35360E-05  1.99074E-05  1.59240E-05  1.23014E-05  9.42997E-06
  9  2.28841E-05  2.17034E-05  1.96642E-05  1.71593E-05  1.49083E-05  1.22992E-05  9.75111E-06  7.06263E-06
 10  1.64911E-05  1.57036E-05  1.42959E-05  1.24233E-05  1.11597E-05  9.57851E-06  7.74635E-06  6.23136E-06
 11  1.21659E-05  1.15087E-05  1.07009E-05  9.83913E-06  8.77070E-06  7.57064E-06  6.30744E-06  5.14287E-06
 12  9.16325E-06  8.93420E-06  8.10575E-06  7.65136E-06  5.93066E-06  6.08720E-06  5.16077E-06  4.29641E-06
 13  7.02271E-06  5.83299E-06  6.48541E-06  6.00693E-06  5.55278E-06  4.92945E-06  4.27537E-06  3.62157E-06
 14  5.49573E-06  5.35670E-06  5.16071E-06  4.05534E-06  4.49932E-06  4.05516E-06  3.56917E-06  3.09086E-06
 15  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
        XRR  16 THRU  XRR  74 SAME AS ABOVE

XRR    YZT  9       YZT 10       YZT 11       YZT 12       YZT 13       YZT 14       YZT 15       YZT 16
  1  1.81226E-05  1.25218E-05  8.74282E-06  0.0          0.0          0.0          0.0          0.0
  2  1.70964E-05  1.16392E-05  9.36032E-06  0.0          0.0          0.0          0.0          0.0
  3  1.55106E-05  1.09240E-05  7.54214E-06  0.0          0.0          0.0          0.0          0.0
  4  1.39433E-05  1.02164E-05  7.29951E-06  0.0          0.0          0.0          0.0          0.0
  5  1.25444E-05  9.13324E-06  6.59325E-06  0.0          0.0          0.0          0.0          0.0
  6  9.77092E-06  7.23132E-06  5.33357E-06  0.0          0.0          0.0          0.0          0.0
  7  8.52337E-06  5.39937E-06  4.81593E-06  0.0          0.0          0.0          0.0          0.0
  8  7.24235E-06  5.57139E-06  4.41308E-06  0.0          0.0          0.0          0.0          0.0
  9  6.03202E-06  4.77225E-06  3.79900E-06  0.0          0.0          0.0          0.0          0.0
 10  4.09565E-06  4.02949E-06  3.27795E-06  0.0          0.0          0.0          0.0          0.0
 11  4.17726E-06  3.42197E-06  2.53000E-06  0.0          0.0          0.0          0.0          0.0
 12  3.54564E-06  2.70735E-06  2.60209E-06  0.0          0.0          0.0          0.0          0.0
 13  3.04267E-06  2.56400E-06  2.13008E-06  0.0          0.0          0.0          0.0          0.0
 14  2.64419E-06  2.27007E-06  1.92701E-06  0.0          0.0          0.0          0.0          0.0
 15  0.0          0.0          0.0          0.0          0.0          0.0          0.0          0.0
        XRR  16 THRU  XRR  74 SAME AS ABOVE

XRR    YZT 17       YZT 18       YZT 19       YZT 20       YZT 21       YZT 22       YZT 23       YZT 24
  1  0.0          0.0          [illegible]  3.05712E-07  2.05366E-07  2.36743E-07  2.09549E-07  1.85510E-07
  2  0.0          0.0          3.47239E-07  3.04572E-07  2.67912E-07  2.34241E-07  2.08525E-07  1.84129E-07
  3  0.0          0.0          3.46421E-07  3.03950E-07  2.66053E-07  2.35205E-07  2.06002E-07  1.81505E-07
  4  0.0          0.0          [illegible]  3.01970E-07  2.62961E-07  2.27971E-07  2.02121E-07  1.78341E-07
  5  0.0          0.0          3.41500E-07  2.94802E-07  2.59190E-07  2.24941E-07  1.97762E-07  1.74653E-07
  6  0.0          0.0          3.31431E-07  2.86596E-07  2.49655E-07  2.19252E-07  1.93494E-07  1.71311E-07
  7  0.0          0.0          [illegible]  2.81979E-07  2.45051E-07  2.15021E-07  1.89584E-07  1.67901E-07
  8  0.0          0.0          3.22567E-07  2.89111E-07  2.42951E-07  2.11526E-07  1.86304E-07  1.64736E-07
  9  0.0          0.0          3.01652E-07  2.57571E-07  2.30322E-07  2.07944E-07  1.83140E-07  1.61614E-07
 10  0.0          0.0          [illegible]  2.52170E-07  2.25260E-07  2.00831E-07  1.78494E-07  1.58415E-07
 11  0.0          0.0          2.56190E-07  2.31990E-07  2.13040E-07  1.91936E-07  1.72064E-07  1.53064E-07
 12  0.0          0.0          2.52561E-07  2.20063E-07  2.03040E-07  1.81200E-07  1.64905E-07  1.48302E-07
 13  0.0          0.0          2.47796E-07  2.10109E-07  1.94453E-07  1.75179E-07  1.57912E-07  1.42409E-07
 14  0.0          0.0          2.29782E-07  2.00234E-07  1.86000E-07  1.67760E-07  1.51431E-07  1.36729E-07
 15  0.0          0.0          2.17310E-07  1.93580E-07  1.77715E-07  1.60620E-07  1.45170E-07  1.31230E-07
 16  0.0          0.0          2.05357E-07  1.87092E-07  1.69512E-07  1.53579E-07  1.39641E-07  1.25870E-07
 17  0.0          0.0          1.95150E-07  1.76106E-07  1.61074E-07  1.46721E-07  1.33084E-07  1.20670E-07
 18  0.0          0.0          [illegible]  1.59067E-07  1.54190E-07  1.40130E-07  1.27305E-07  1.15595E-07
 19  0.0          0.0          1.77172E-07  1.51723E-07  1.47111E-07  1.33833E-07  1.21724E-07  1.10667E-07
 20  0.0          0.0          [illegible]  1.54264E-07  1.40370E-07  1.27810E-07  1.16364E-07  1.05903E-07
 21  0.0          0.0          [illegible]  1.47074E-07  1.33952E-07  1.22057E-07  1.11219E-07  1.01309E-07
 22  0.0          0.0          [illegible]  [illegible]  1.27747E-07  1.16543E-07  [illegible]  [illegible]
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 23  0.0     0.0     [illegible]   1.31048E-07   1.21867E-07   1.11203E-07   1.01494E-07   9.26027E-08
 24  0.0     0.0     [illegible]   1.27312E-07   1.16146E-07   1.05075E-07   9.60784E-08   8.84744E-08
 25  0.0     0.0     [illegible]   1.21229E-07   1.10646E-07   1.01111E-07   9.24355E-08   8.44744E-08
 26  0.0     0.0     [illegible]   [illegible]   1.05353E-07   9.63509E-08   8.81305E-08   8.06241E-08
 27  0.0     0.0     [illegible]   1.09750E-07   1.00207E-07   9.17403E-08   8.40127E-08   7.68943E-08
 28  0.0     0.0     [illegible]   1.04345E-07   9.53093E-08   8.73549E-08   8.00201E-08   7.33245E-08
 29  0.0     0.0     [illegible]   9.91610E-08   9.07048E-08   8.31138E-08   7.62180E-08   6.98795E-08
 30  0.0     0.0     [illegible]   9.41792E-08   8.62250E-08   7.90541E-08   7.25580E-08   6.65985E-08
 31  0.0     0.0     [illegible]   8.94390E-08   8.19251E-08   7.52034E-08   6.90678E-08   6.34470E-08
 32  0.0     0.0     [illegible]   [illegible]   7.78614E-08   7.15034E-08   6.57517E-08   6.04522E-08
 33  0.0     0.0     [illegible]   [illegible]   7.39074E-08   6.80319E-08   6.25909E-08   5.76173E-08
 34  0.0     0.0     [illegible]   7.65118E-08   7.03200E-08   6.47117E-08   5.95316E-08   5.49263E-08
 35  0.0     0.0     [illegible]   [illegible]   6.68018E-08   6.16319E-08   5.68251E-08   5.24220E-08
 36  0.0     0.0     [illegible]   [illegible]   6.36454E-08   5.87249E-08   5.42322E-08   5.00632E-08
 37  0.0     0.0     [illegible]   6.57300E-08   6.06470E-08   5.60480E-08   5.18104E-08   4.79056E-08
 38  0.0     0.0     [illegible]   [illegible]   5.79455E-08   5.35904E-08   4.96041E-08   4.54123E-08
 39  0.0     0.0     [illegible]   [illegible]   5.53935E-08   5.13479E-08   4.76033E-08   4.41230E-08
 40  0.0     0.0     [illegible]   [illegible]   5.31529E-08   4.93524E-08   4.58274E-08   4.25241E-08
 41  0.0     0.0     [illegible]   [illegible]   5.11993E-08   4.76242E-08   4.42815E-08   4.11509E-08
 42  0.0     0.0     [illegible]   [illegible]   4.95595E-08   4.61627E-08   4.29793E-08   3.99794E-08
 43  0.0     0.0     [illegible]   [illegible]   4.80339E-08   4.47793E-08   4.19255E-08   3.90366E-08
 44  0.0     0.0     [illegible]   [illegible]   4.72290E-08   4.41004E-08   4.11473E-08   3.83581E-08
 45  0.0     0.0     0.0           0.0           0.0           0.0           0.0           0.0
        XPR   45 THRU  AND   76 SAME AS ABOVE

XPR    YZT 25 .      YZT 26 .      YZT 27 .      YZT 28 .      YZT 29 .      YZT 30 .      YZT 31 .      YZT 32 .
  1  [illegible]   1.44910E-07   [illegible]   [illegible]   9.95591E-08   8.74909E-08   7.65685E-08   0.0
  2  1.62551E-07   1.43730E-07   [illegible]   1.12237E-07   9.90271E-08   8.71081E-08   7.62174E-08   0.0
  3  [illegible]   [illegible]   [illegible]   1.11160E-07   9.82114E-08   8.64881E-08   7.58631E-08   0.0
  4  [illegible]   [illegible]   [illegible]   1.09913E-07   9.71773E-08   8.58672E-08   7.49910E-08   0.0
  5  [illegible]   [illegible]   [illegible]   1.08301E-07   9.59359E-08   8.46591E-08   7.41947E-08   0.0
  6  [illegible]   [illegible]   [illegible]   [illegible]   9.45751E-08   8.35307E-08   7.33098E-08   0.0
  7  [illegible]   1.32621E-07   [illegible]   1.04905E-07   9.31925E-08   8.24208E-08   7.24190E-08   0.0
  8  [illegible]   [illegible]   [illegible]   1.03149E-07   9.17277E-08   8.11175E-08   7.16140E-08   0.0
  9  [illegible]   [illegible]   [illegible]   1.01262E-07   9.01318E-08   8.00998E-08   7.08354E-08   0.0
 10  [illegible]   [illegible]   1.11414E-07   [illegible]   [illegible]   7.87107E-08   7.00011E-08   6.23921E-08
 11  [illegible]   [illegible]   [illegible]   9.73373E-08   [illegible]   [illegible]   6.90533E-08   6.14704E-08
 12  [illegible]   [illegible]   [illegible]   [illegible]   8.51240E-08   [illegible]   [illegible]   6.03175E-08
 13  [illegible]   [illegible]   [illegible]   [illegible]   8.32067E-08   [illegible]   6.64773E-08   5.90195E-08
 14  [illegible]   [illegible]   1.00517E-07   [illegible]   8.10758E-08   7.26279E-08   6.49494E-08   5.76905E-08
 15  [illegible]   [illegible]   [illegible]   8.72911E-08   7.05910E-08   [illegible]   6.32297E-08   5.62202E-08
 16  [illegible]   [illegible]   [illegible]   8.41371E-08   7.54750E-08   [illegible]   6.13044E-08   5.45969E-08
 17  [illegible]   [illegible]   [illegible]   8.10470E-08   7.31735E-08   [illegible]   5.92923E-08   5.28879E-08
 18  [illegible]   9.51441E-08   8.62114E-08   [illegible]   [illegible]   [illegible]   5.72603E-08   5.11370E-08
 19  [illegible]   [illegible]   [illegible]   [illegible]   6.79137E-08   6.13309E-08   5.52457E-08   4.93894E-08
 20  [illegible]   [illegible]   [illegible]   7.21531E-08   6.53521E-08   5.90739E-08   5.32645E-08   4.76611E-08
 21  [illegible]   [illegible]   [illegible]   [illegible]   6.28297E-08   [illegible]   5.13094E-08   4.59609E-08
 22  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   4.42838E-08
 23  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   4.26374E-08
 24  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   4.56531E-08   4.10200E-08
 25  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   3.94417E-08
 26  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]
 27  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   3.64054E-08
 28  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   3.49547E-08
 29  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   3.35474E-08
 30  [illegible]   [illegible]   [illegible]   [illegible]   4.29212E-08   [illegible]   [illegible]   3.21927E-08
 31  [illegible]   [illegible]   [illegible]   [illegible]   4.10764E-08   3.74914E-08   3.41430E-08   3.08841E-08
 32  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   3.27210E-08   2.96332E-08
 33  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   2.84332E-08
 34  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   2.72943E-08
 35  [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   [illegible]   2.62122E-08
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~~[illegible]~~

~~[illegible]~~

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 36  [illegible]      [illegible]      [illegible]      [illegible]      [illegible]      [illegible]      [illegible]      [illegible]
 37  4.42573E-08      4.0[illegible]E-08 3.767571E-08   3.609[illegible]E-08 3.1[illegible]E-08 2.921411E-08 2.670156E-08  2.4239[illegible]E-08
 38  4.24775E-08      3.92477E-08      3.6[illegible]E-08 3.337[illegible]E-08 3.06[illegible]E-08 2.813[illegible]E-08 2.57237E-08 2.33[illegible]E-08
 39  4.0[illegible]E-08 3.7[illegible]E-08 3.4[illegible]E-08 3.21[illegible]E-08 2.961[illegible]E-08 2.71[illegible]E-08 2.48201E-08 2.25320E-08
 40  3.9[illegible]E-08 3.6[illegible]E-08 3.37577E-08   3.11[illegible]E-08 2.8[illegible]22E-08 2.620[illegible]E-08 2.40302E-08 2.17[illegible]E-08
 41  3.819[illegible]E-08 3.53995E-08  3.27467E-08      3.02255E-08      2.79134E-08      2.55149E-08      2.33095E-08      2.11270E-08
 42  3.71442E-08      3.44571E-08      3.19014E-08      2.94618E-08      2.71259E-08      2.48751E-08      2.27081E-08      2.05316E-08
 43  3.63[illegible]E-08 3.37151E-08   3.12374E-08      2.88687E-08      2.65898E-08      2.43891E-08      2.22479E-08      2.00786E-08
 44  3.57122E-08      3.31919E-08      3.07836E-08      2.84655E-08      2.62298E-08      2.40610E-08      2.19414E-08      1.97753E-08
 45  0.0              0.0              0.0              0.0              0.0              0.0              0.0              0.0
     XRR   46 THRU  XRR   76 SAME AS ABOVE

XRR   YZT 33         YZT 34         YZT 35         YZT 36         YZT 37         YZT 38         YZT 39         YZT 40
  1   0.0            0.0            0.0            0.0            0.0            0.0            0.0            0.0
      XRR    2 THRU  XRR    9 SAME AS ABOVE
 10   5.57340E-08    4.94514E-08    0.0            0.0            0.0            0.0            0.0            0.0
 11   5.44[illegible]E-08 4.79[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 12   5.3212[illegible]E-08 4.6[illegible]510E-08 0.0 0.0           0.0            0.0            0.0            0.0
 13   5.26310E-08    4.555[illegible]E-08 0.0       0.0            0.0            0.0            0.0            0.0
 14   5.0[illegible]E-08 4.44[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 15   4.95542E-08    4.33[illegible]E-08 0.0        0.0            0.0            0.0            0.0            0.0
 16   4.81[illegible]E-08 4.22310E-08 0.0           0.0            0.0            0.0            0.0            0.0
 17   4.67[illegible]E-08 4.10[illegible]E-08 0.0   0.0            0.0            0.0            0.0            0.0
 18   4.52[illegible]E-08 3.9[illegible]011E-08 0.0 0.0            0.0            0.0            0.0            0.0
 19   4.377[illegible]E-08 3.85435E-08 0.0          0.0            0.0            0.0            0.0            0.0
 20   4.22[illegible]E-08 3.720[illegible]E-08 0.0  0.0            0.0            0.0            0.0            0.0
 21   4.[illegible]214E-08 3.5[illegible]317E-08 0.0 0.0           0.0            0.0            0.0            0.0
 22   3.93[illegible]E-08 3.[illegible]E-08 0.0     0.0            0.0            0.0            0.0            0.0
 23   3.79[illegible]E-08 3.3[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 24   3.6[illegible]17E-08 3.240[illegible]E-08 0.0 0.0            0.0            0.0            0.0            0.0
 25   3.5192[illegible]E-08 3.123[illegible]E-08 0.0 0.0           0.0            0.0            0.0            0.0
 26   3.3[illegible]E-08 3.00[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 27   3.25[illegible]71E-08 2.957[illegible]E-08 0.0 0.0           0.0            0.0            0.0            0.0
 28   3.12[illegible]E-08 2.7[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 29   3.[illegible]71E-08 2.6[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 30   2.[illegible]E-08 2.5[illegible]E-08 0.0      0.0            0.0            0.0            0.0            0.0
 31   2.77375E-08    2.4[illegible]E-08 0.0         0.0            0.0            0.0            0.0            0.0
 32   2.66351E-08    2.3[illegible]E-08 0.0         0.0            0.0            0.0            0.0            0.0
 33   2.55514E-08    2.2[illegible]E-08 0.0         0.0            0.0            0.0            0.0            0.0
 34   2.45[illegible]E-08 2.2[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 35   2.3[illegible]E-08 2.11[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 36   2.27[illegible]E-08 2.03[illegible]E-08 0.0   0.0            0.0            0.0            0.0            0.0
 37   2.18[illegible]E-08 1.9[illegible]E-08 0.0    0.0            0.0            0.0            0.0            0.0
 38   2.1[illegible]E-08 1.8[illegible]E-08 0.0     0.0            0.0            0.0            0.0            0.0
 39   2.02[illegible]E-08 1.[illegible]E-08 0.0     0.0            0.0            0.0            0.0            0.0
 40   1.9[illegible]E-08 1.7[illegible]E-08 0.0     0.0            0.0            0.0            0.0            0.0
 41   1.[illegible]E-08 1.[illegible]E-08 0.0       0.0            0.0            0.0            0.0            0.0
 42   1.[illegible]E-08 1.6[illegible]E-08 0.0      0.0            0.0            0.0            0.0            0.0
 43   1.7[illegible]E-08 1.5[illegible]101E-08 0.0  0.0            0.0            0.0            0.0            0.0
 44   1.75259E-08    1.52[illegible]71E-08 0.0      0.0            0.0            0.0            0.0            0.0
 45   0.0            0.0            0.0            0.0            0.0            0.0            0.0            0.0
      XRR   46 THRU  XRR   76 SAME AS ABOVE

XRR   YZT 41         YZT 42         YZT 43         YZT 44         YZT 45         YZT 46         YZT 47         YZT 48
  1   0.0            0.0            0.0            0.0            0.0            0.0            0.0            0.0
      XRR    2 THRU  XRR   76 SAME AS ABOVE

XRR   YZT 49         YZT 50         YZT 51
  1   0.0            0.0            0.0
      XRR    2 THRU  XRR   76 SAME AS ABOVE
```

Hauu
avec
conv

- APPENDIX 8 -

Fission Spectrum used in the DOT.Volume calculations

1	1.1397 - 02	24	3.1754 - 04
2	1.2811 - 01	25	6.6479 - 04
3	2.0443 - 01	26	4.6677 - 04
4	1.3782 - 01	27	2.2127 - 04
5	8.7001 - 02	28	1.0475 - 04
6	1.7859 - 01	29	1.3075 - 05
7	5.3485 - 02	30	1.1256 - 05
8	4.3828 - 02	31	2.5214 - 05
9	1.8626 - 02	32	2.3422 - 05
10	3.1450 - 02	33	1.1069 - 05
11	2.477 - 02	34	5.2303 - 06
12	1.0260 - 02	35	2.4711 - 06
13	2.3681 - 03	36	1.1674 - 07
14	6.6647 - 03	37	5.5146 - 07
15	1.4832 - 02	38	3.3345 - 07
16	1.1409 - 02	39	1.0825 - 07
17	8.6880 - 03	40	4.0428 - 08
18	9.2425 - 03	41	9.0210 - 09
19	6.5691 - 03	42	1.7498 - 09
20	2.2773 - 03	43	5.6810 - 10
21	4.2906 - 03	44	1.4410 - 10
22	1.9151 - 03	45	0.
23	1.4443 - 04		

- APPENDIX 9 -

PROPANE Do - 45G

G	Corres-pondance to BABEL	En sup	Δu	G	Corres-pondance to BABEL	En sup	Δu
1	1- 7	14.19 MeV	0.65	24	65-66	24.788 KeV	0.125
2	8-17	7.408	0.70	25	67-68	21.87	0.375
3	18-23	3.678	0.50	26	69-70	15.03	0.5
4	24-26	2.231	0.30	27	71-72	9.11	0.5
5	27-28	1.65	0.20	28	73-74	5.53	0.5
6	29-33	1.3534	0.50	29	75	3.35	0.1
7	34-35	820.85 KeV	0.20	30	76	3.03	0.1
8	36-37	672.06	0.20	31	77-78	2.74	0.3
9	38-39	550.23	0.1	32	79-80	2.03	0.5
10	40-41	497.87	0.20	33	81-82	1.23	0.5
11	42-43	407.62	0.20	34	83-84	748.52 eV	0.5
12	44	333.79	0.1	35	85-86	454.0	0.5
13	45-46	301.97	0.025	36	87-88	275.36	0.5
14	47	294.517	0.075	37	89-90	167.02	0.5
15	48-49	273.24	0.2	38	91-93	101.30	0.75
16	50-51	223.71	0.2	39	94-96	47.85	0.75
17	52-53	183.16	0.20	40	97-100	22.603	0.75
18	54-56	149.96	0.30	41	101-104	8.315	1.0
19	57-58	111.09	0.333	42	105-107	3.05	0.75
20	59	79.6	0.166	43	108-110	1.445	0.75
21	60-61	67.38	0.5	44	111-112	0.6825	0.5
22	62-63	40.87	0.45	45	113	0.414	-
23	64	26.05	0.05				

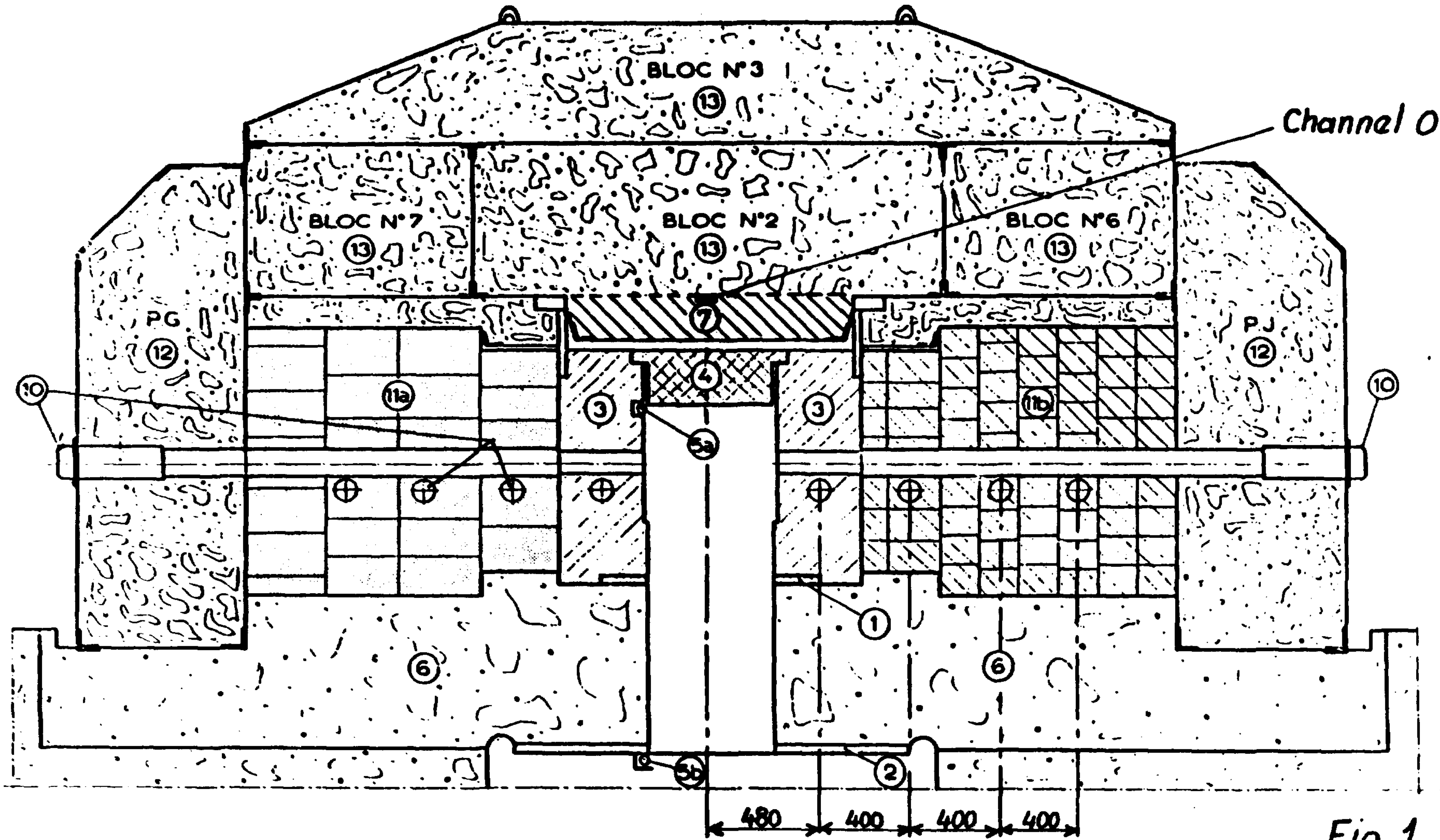


Fig. 1

3 and 4 : Stainless - steel

11a : Thermal column : graphite

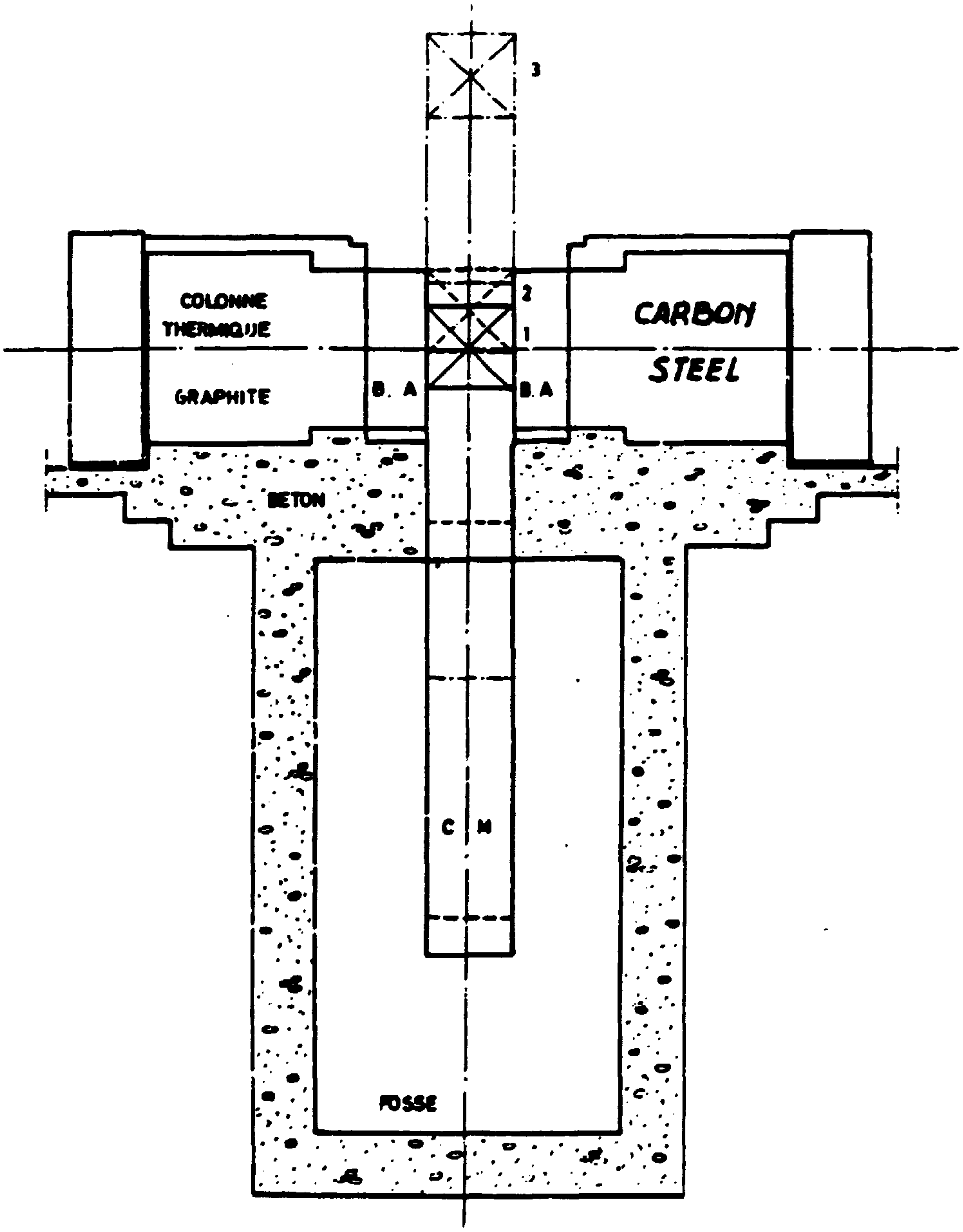
11b : Carbon steel

2-3-6-7-12-13 : Concrete

10 : Horizontal measurement channel (not used in the present experiment)

7 : Zone for stainless - steel slabs or UO_2-Na blanket (Harmonie configuration without or with blanket)
(The blocks 2 , 3 , 6 and 7 are eliminated during the experiments)

Core positions



1. Low position
2. Intermediate position
3. High position

Fig. 2

Fig. 3

Sodium Tanks

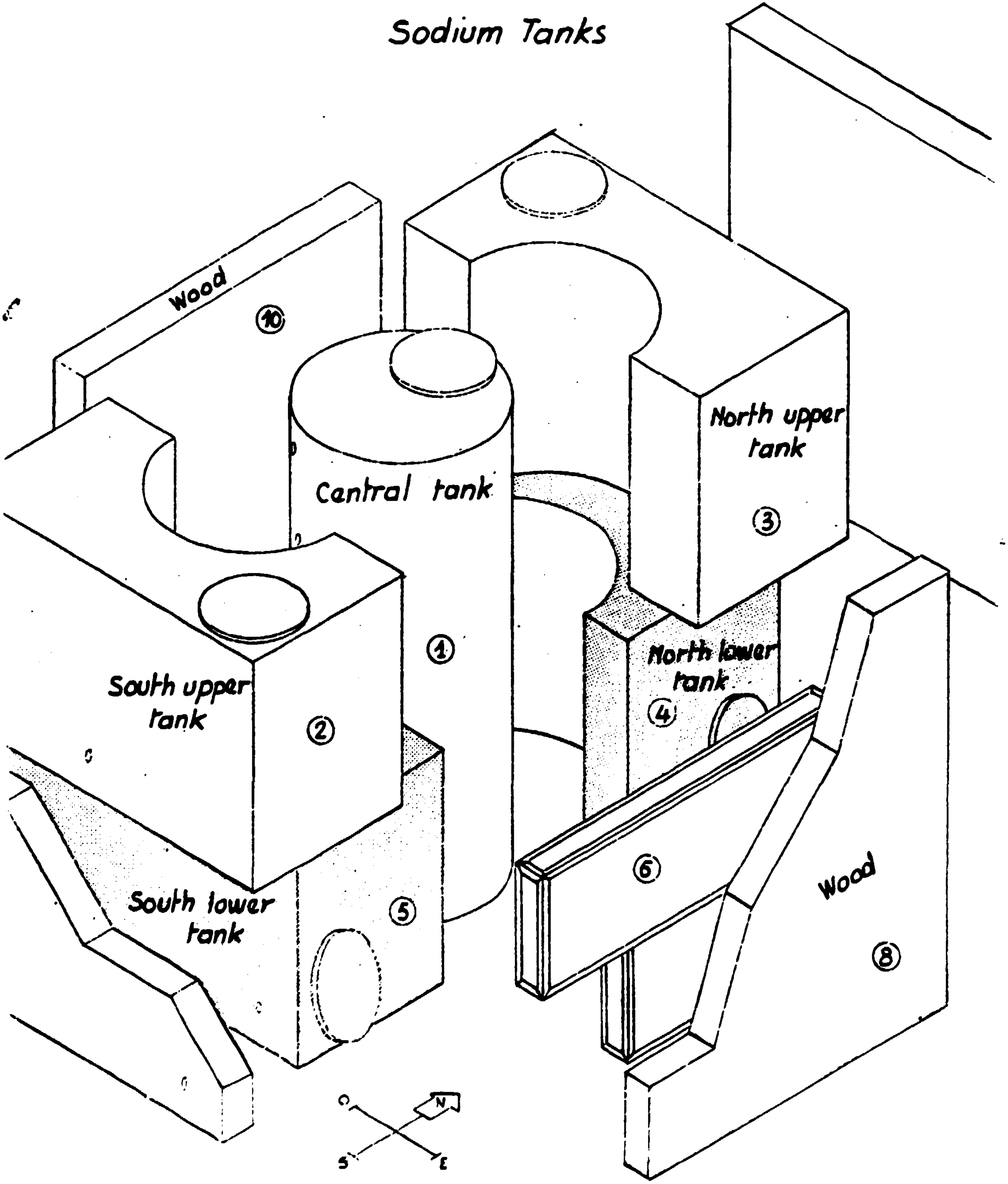
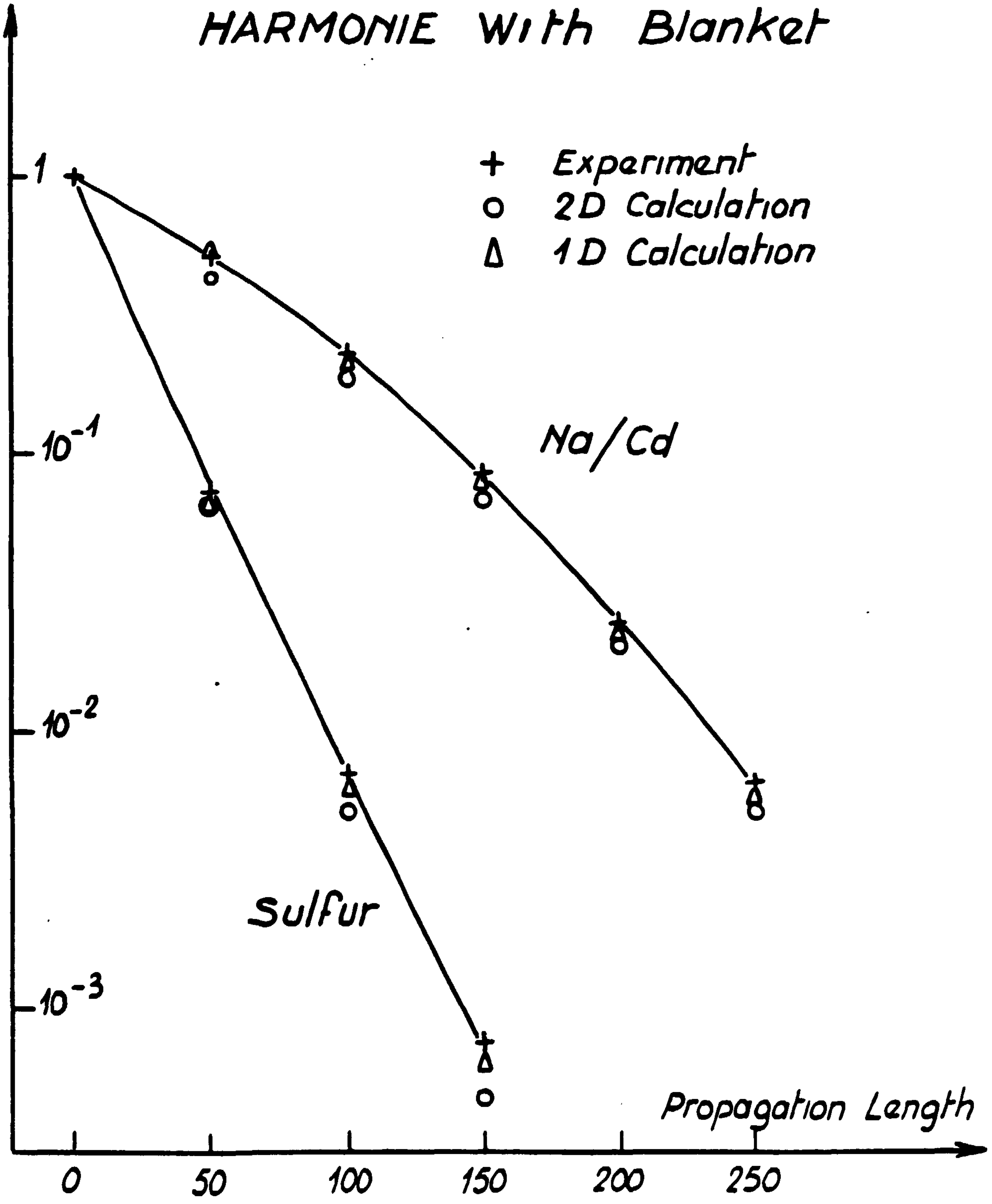
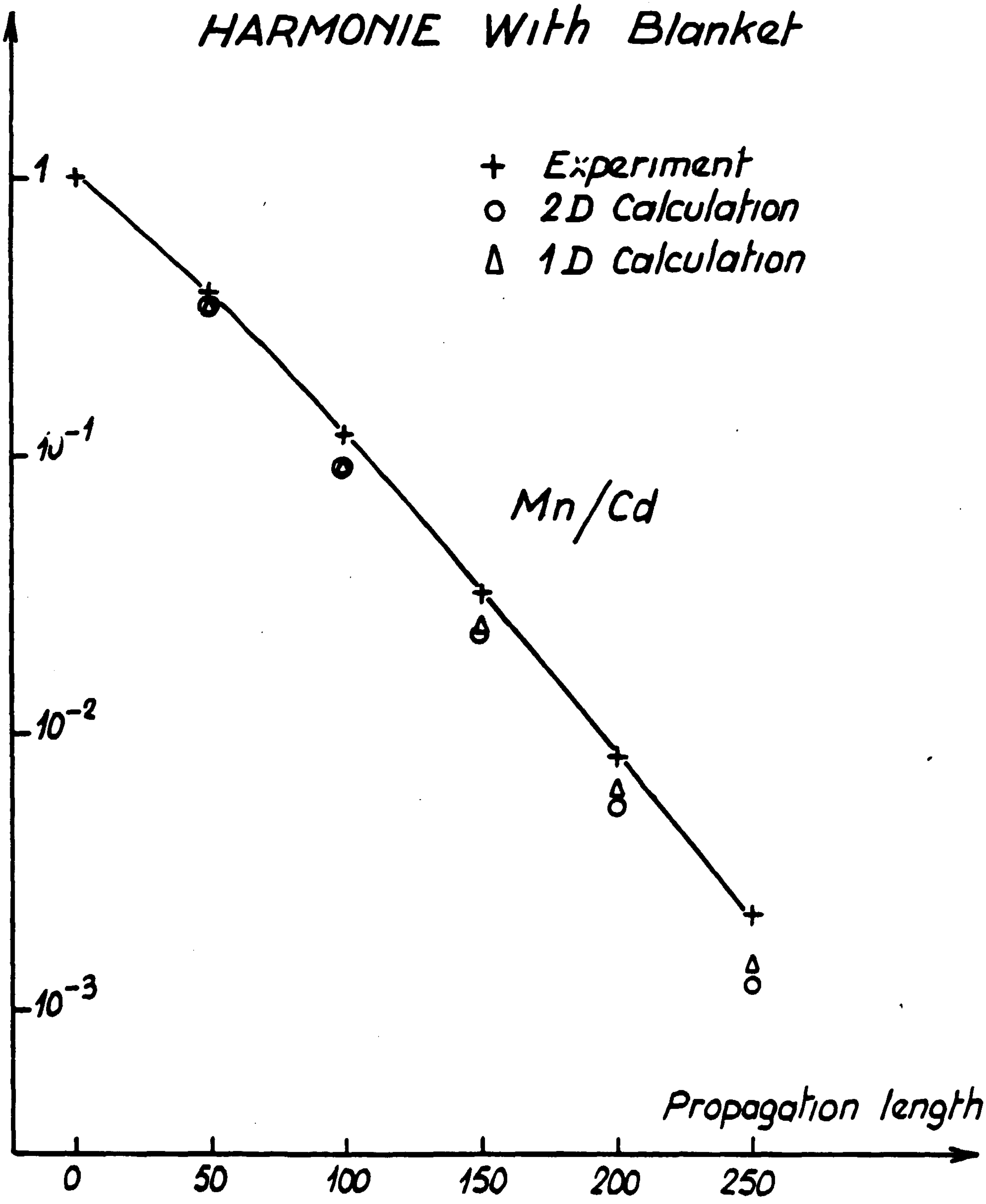


Fig. 4



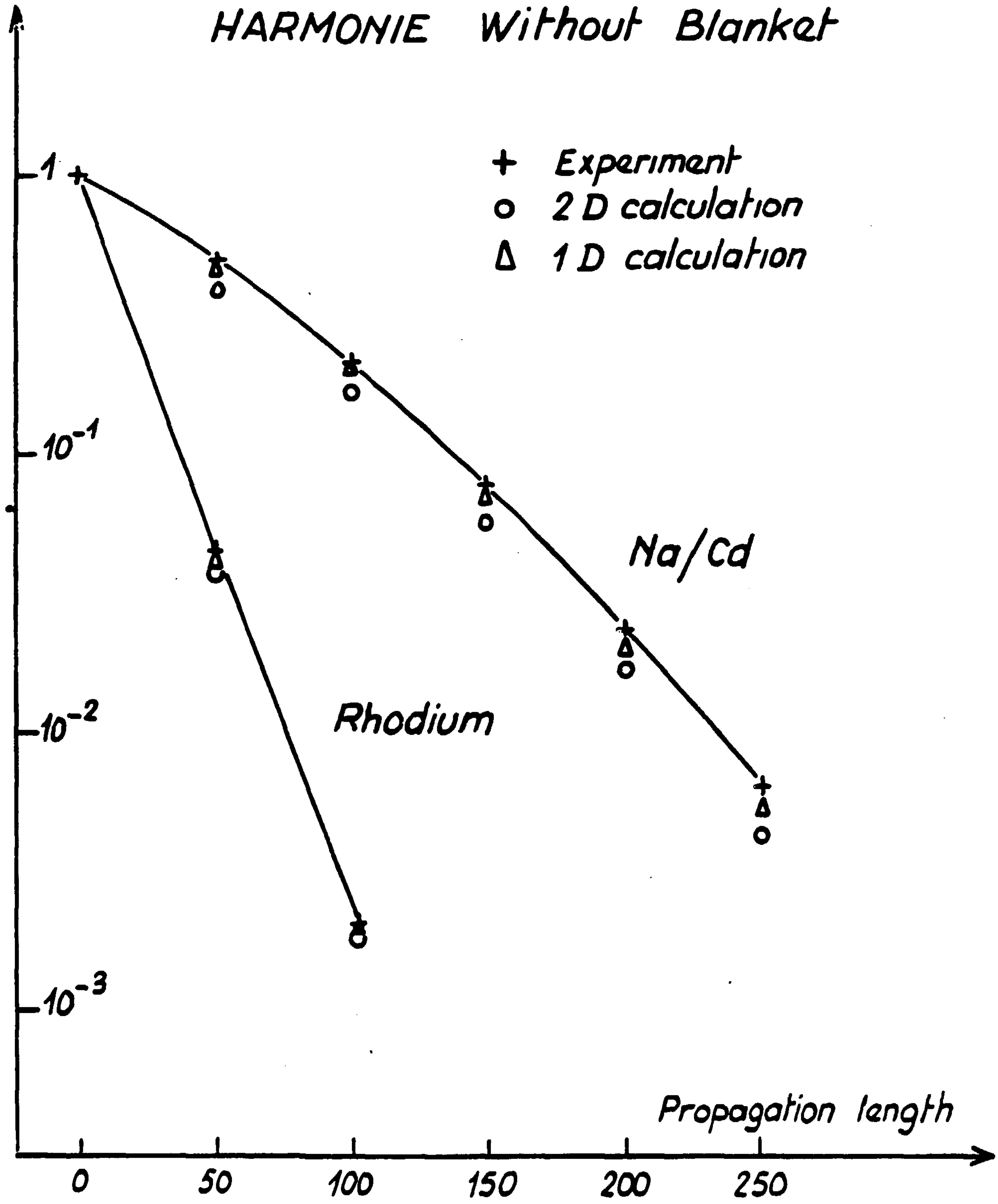
HARMONIE With Blanket

Fig. 5



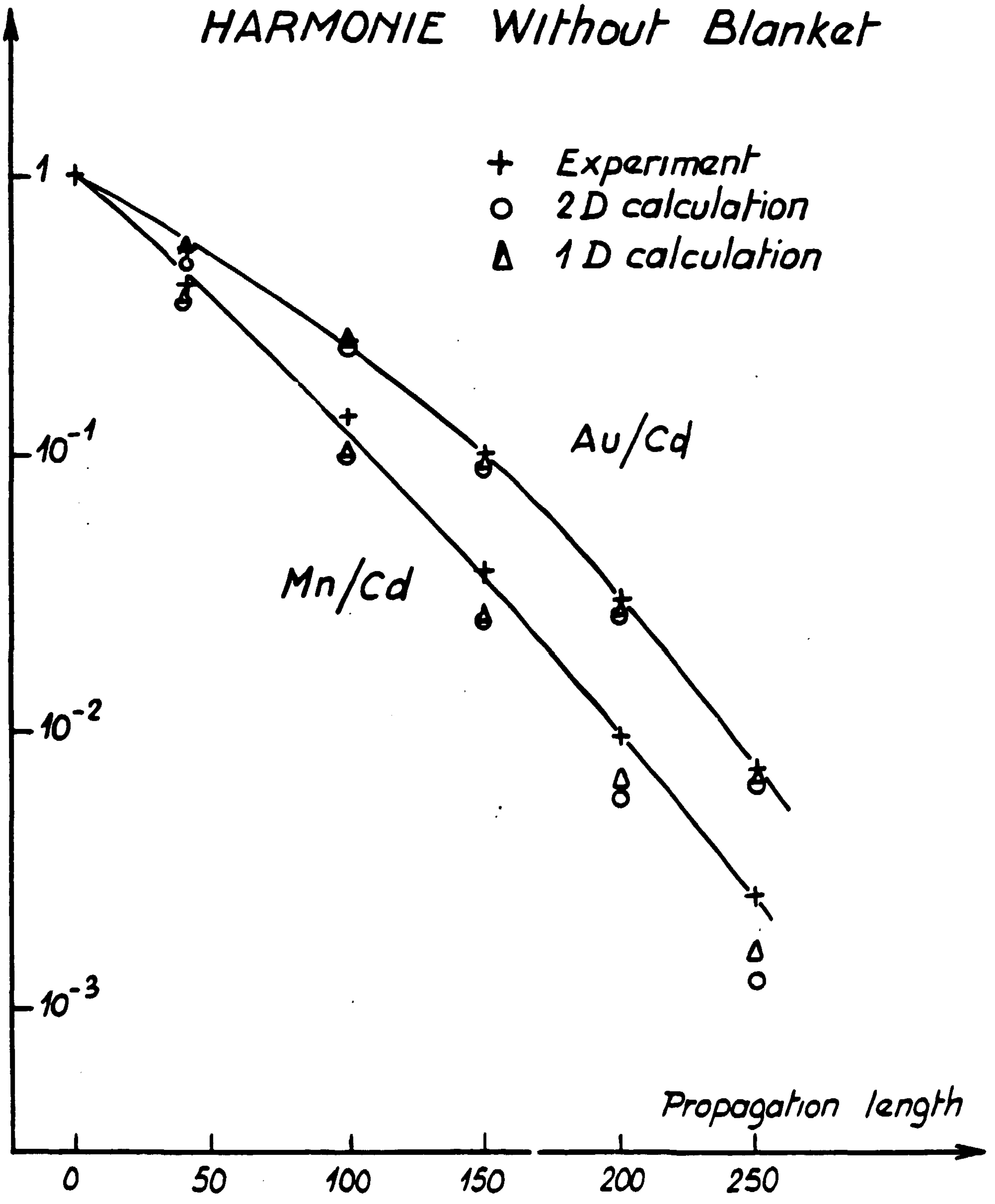
HARMONIE With Blanket

Fig. 6



HARMONIE Without Blanket

Fig.7


HARMONIE Without Blanket
+ Experiment
o 2D calculation
Δ 1D calculation
1
10^-1
10^-2
10^-3
Au/Cd
Mn/Cd
Propagation length
0
50
100
150
200
250

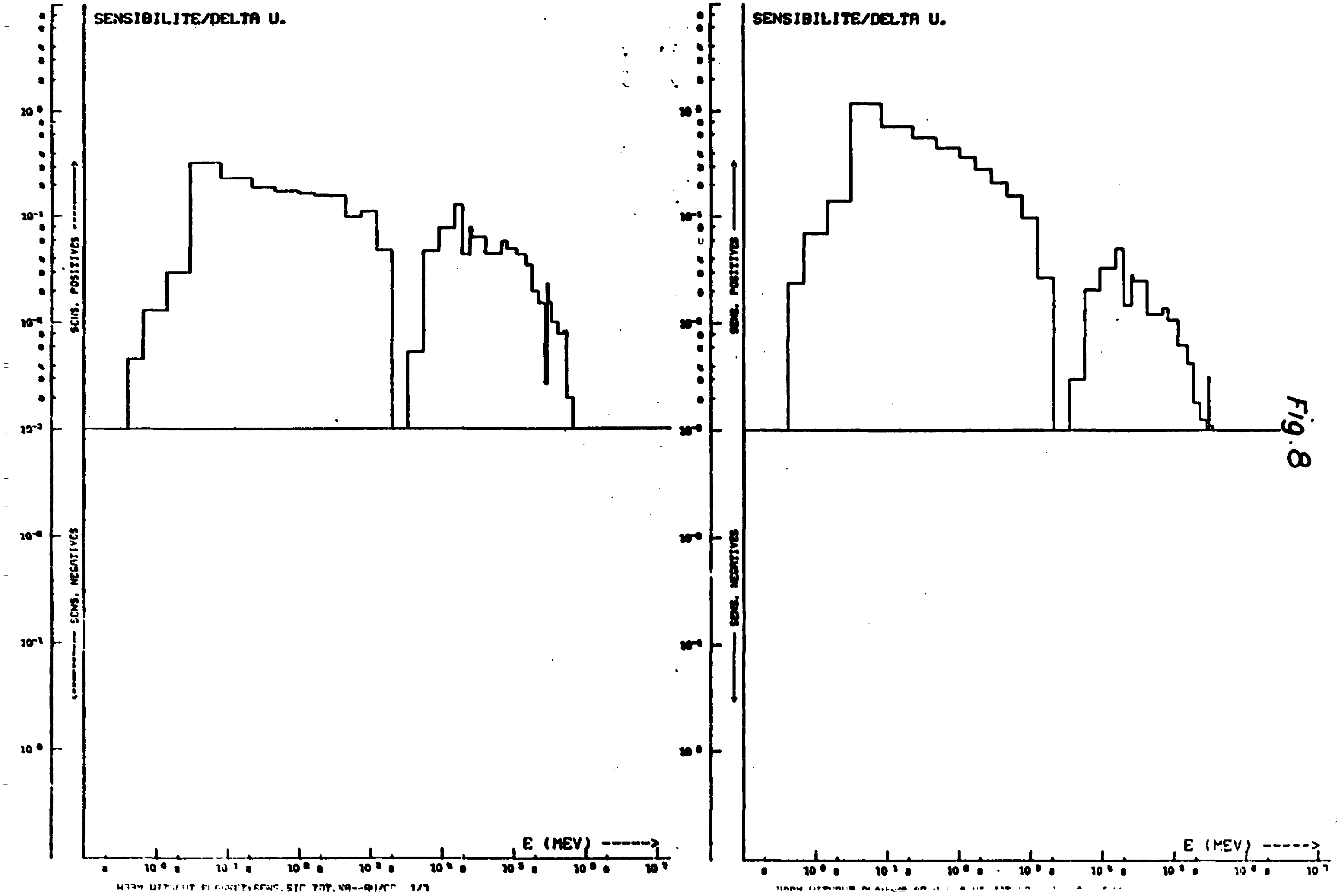

SENSIBILITE/DELTA U.
SENS. POSITIVES
SENS. NEGATIVES
E (MEV)
SENSIBILITE/DELTA U.
SENS. POSITIVES
SENS. NEGATIVES
E (MEV)

Fig. 8

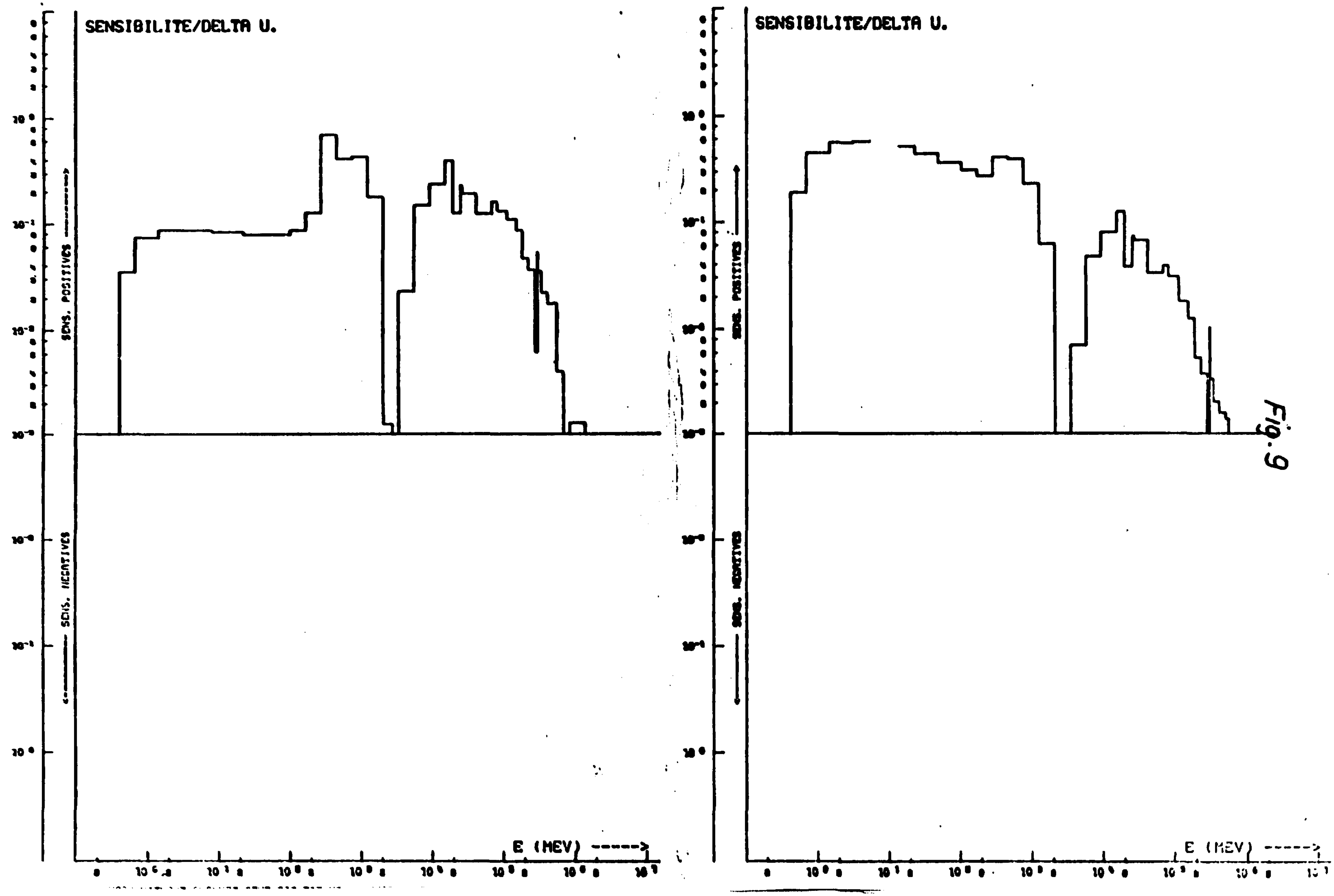

SENSIBILITE/DELTA U.
SENS. POSITIVES
SENS. NEGATIVES
E (MEV)
SENSIBILITE/DELTA U.
SENS. POSITIVES
SENS. NEGATIVES
E (MEV)

Fig. 9