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EUROPEAN ATOMIC ENERGY COMMUNITY - EURATOM

**THE ACTIVITIES OF THE EURATOM DOSIMETRY
WORKING GROUP
FOR THE PERIOD SEPTEMBER 1962 TO JUNE 1964**

by

P. DELATTRE (CEA, Saclay)

and

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1964



* Central Nuclear Measurements Bureau - CNMB
Paper presented to the IAEA Panel on In-Pile Dosimetry
Vienna, Austria, July 13-17, 1964

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European Atomic Energy Community - EURATOM
Central Nuclear Measurements Bureau (CNMB)
Brussels, December 1964 - 15 pages.

The present report of the Euratom Dosimetry Working Group supplements
the first report (P. Delattre and A. Prosdociani: Les activités du groupe de
travail Dosimétrie d'Euratom, EUR 88.f) and refers to the activities of the
Group from September 1962 to June 1964. In this period the 7th to 12th
Plenary Meetings as well as several meetings of sub-groups were held.



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THE ACTIVITIES OF THE EURATOM DOSIMETRY WORKING GROUP
FOR THE PERIOD SEPTEMBER 1962 TO JUNE 1964

1. Introduction

The present report of the Euratom Dosimetry Working Group supplements the first one^{*)} and refers to the activities of the Group from September 1962 to June 1964. In this period the 7th to 12th Plenary Meetings as well as several meetings of sub-groups were held. To date, sub-groups have been formed for the following subjects:

- use of cobalt for integral flux measurements of thermal neutrons;
- sample technology;
- cross-section compilation;
- terminology.

The Sample Technology Sub-group has held two meetings at Saclay and Geel and has tried to get a first survey on the possibilities and requests for sample preparation as, since the CNMB receives requests for several thousands of samples, a certain organisation and normalisation will be a worthwhile task.

*) Delattre, P., and Prosdocimi A.: Les activités du groupe de travail Dosimétrie d'Euratom, EUR 88.f (1962).

The terminology subgroup has made two main efforts, one for unifying the use of symbols and neutron physics expressions (Rep. No. 114, 143, 144, 145, 169 given in ^{the} appendix), the other for a common language in the field of errors and corrections of measured values (Rep. Nos. 155, 156).

2. Measurements on thermal neutrons and low-energy intermediate neutrons.

For more details on the subject here dealt with, the attached reference list could be used. We will only mention here the subjects which have been considered of greatest importance; these can be summarized under the following headings :

a) Use of cobalt for integrating thermal neutron fluxes. Working Group members have been advised to use this method systematically in order to ease the comparisons between the experiments carried out in the different reactors of the European Community countries. Publication ^{of} the text detailing the applying method has been delayed; the final document will only be issued for the 13th Working Group meeting, in October 1964. This delay has been caused by the fact that new comparative measurements of gold and cobalt cross-sections needed to be done, in order to choose a coherent value for the latter as regards that of gold, taken as a reference at 98.8 barns (Rep. No. 132, 133). For a valid standardization, it has also been necessary to make a first intercalibration of the counting equipment belonging to the different laboratories of the Community countries (Rep. No. 113). To perform this task, standards for cobalt have been distributed by the Central Bureau for Nuclear Measurements to the different laboratories.

b) Investigation of best values of resonance integrals for detectors of interest, and study of spectrometry problems in the fields of low-energy intermediate neutrons (Rep. Nos. 106, 120, 134).

c) Study of continuous measurement methods of instantaneous fluxes in order to follow their variations during reactor operations, particularly in the neighbourhood of experimental facilities (Rep. No. 125, 167, 168).

3. Measurements on high-energy intermediate neutrons and fast neutrons.

For details on the subject dealt with, the reference list given in appendix could also be used. The subjects whose importance was considered as being greatest, can be summarized under the following headings.

a) Choice of cross-section values : differential curves versus energy and comparative values of cross-sections for the main interesting reactions, averaged on a given spectrum (Rep. Nos. 101, 102, 104, 105, 112, 115, 123, 129, 163). The Sub-Working Group for the Compilation of Cross-sections met at Geel in April 1963 in order to state the most useful reactions and the way to make the compilation (Rep. No. 128). Meanwhile, the CBNM published in August 1963 a second volume of the compilation (Rep. No. 129¹⁾) regarding the differential curves as a function of energy. This compilation will be kept up-to-date by yearly additions and corrections.

b) Determination of spectra by entirely experimental methods (threshold detectors, fission chambers, nuclear emulsions, lithium spectrometer) or by mixed methods, i.e. both theoretical and experimental (Rep. Nos. 92, 107, 109, 118, 135, 137, 148, 149, 150, 151, 152, 159, 165).

1) Liskien, H., A. Paulsen : Compilation of cross-sections for some neutron-induced threshold reactions, EUR.119.e (1963).

- c) Integration of fast neutron doses (Rep. No. 108, 119, 130, 153), by using threshold detectors or quartz detectors.
- d) Definition of a standard spectrum for fast neutrons (Rep. No. 126, 136, 147, 154).

A P P E N D I X

PAPERS PRESENTED TO THE WORKING GROUP

- Rep. No. 91 PROSDOCIMI, A. : Minutes of the 6th Meeting of the Working Group ^{on} Reactor Dosimetry. Euratom, Brussels, September 1962.
- 92 LOTT, M., R. SCHUTTLER, J.P. NOEL : Utilisation de la réaction $\text{Li}^6 (n, \alpha) \text{H}^3$ pour la spectrométrie des neutrons rapides. CEN, Fontenay-aux-Roses, Juillet 1962.
- 93 LOTT, M., R. SCHUTTLER, J.P. NOEL : Mesure des flux neutroniques au moyen de détecteurs solides ; influence des gamma et de neutrons rapides, application aux mesures en pile. CEN, Fontenay-aux-Roses, Septembre 1962.
- 94 GIBELLO, A. : Neutron depression by a cadmium box in water. CNEN, Ispra, September 1962.
- 95 NAPOLI, C. : Préparation de composés solubles de l'or pour mesures de oscillation et de activation. CNEN, Ispra, Septembre 1962.
- 96 NAPOLI, C. : Préparation de pellicules contenant des détecteurs. CNEN, Ispra, Septembre 1962.
- 97 FARINELLI, U. : Use of the Ispra-2 reactor for oscillation measurements. CNEN, Ispra, Septembre 1962.
- 98 CHARBONNEL, A. : Quelques résultats relatifs aux détecteurs d'or mince. CEN, Saclay, Octobre 1962.

- Rep. No. 99 CHARBONNEL, A. : Compte rendu de la lère
réunion du sous-comité de technologie des
détecteurs.
CEN, Saclay, Juillet 1962.
- 100 BEAUGE, R. : Influence de la coupure effective
du cadmium sur les intégrales de résonance.
CEN, Fontenay-aux-Roses, Septembre 1962.
- 101 HEERTJE, I., A.H.W. ATEN Jr. :
The cross-section of $\text{Ni}^{58}(n,p)\text{Co}^{58}$
IKO, Amsterdam, September 1962.
- 102 HEERTJE, I., W. NAGEL, A.H.W. ATEN Jr. :
Cross-sections for the $\text{In}^{115}(n,n')\text{In}^{115m}$
reaction.
IKO, Amsterdam, September 1962.
- 103 PROSDOCIMI, A. : Minutes of the 7th Meeting
of the Working Group ^{on} Reactor Dosimetry.
Euratom, Brussels, January 1963.
- 104 HEERTJE, I., A.H.W. ATEN Jr. : Activation
cross-sections of fast neutron detectors.
IKO, Amsterdam, March 1962.
- 105 BEAUGE, R. : Méthode de choix des sections
efficaces ou autres constantes expérimentales.
CEN, Fontenay-aux-Roses, Septembre 1962.
- 106 ZIJP, W.L., A.P.J. MOS : Selfshielding in
resonance detecting foils for neutrons with
energies in the resonance region.
RCN, Petten, January 1963.
- 107 ZIJP, W.L. : The determination of the fast
neutron spectrum in L.F.R. and H.F.R. with
the method of spectral indices.
RCN, Petten, December 1962.

- 108 WOEHRLE, M. : Utilisation du cuivre comme
intégrateur de flux rapide.
CEA, Grenoble, Septembre 1962.
- 109 BRESESTI, M., A.M. DEL TURCO, A. OSTIDICH,
A. ROTA, G. SEGRE : Fast neutron measurements
by threshold detectors in Ispra I and Avogadro
RS I reactors.
Euratom, Ispra, December 1962.
- 110 ROSSI, A. : Dosimetry work at the Sorin
Nuclear Research Centre.
SORIN, Saluggia, December 1962.
- 111 TAUFFENBACH, H.J. : Überblick über die
Kernstrahlungsmesstechnik am Forschungs-
reaktor Geesthacht.
FRG, Geesthacht, Januar 1963.
- 112 KO, P. : Etude du détecteur de Rhodium pour
la dosimétrie des neutrons rapides.
CEN, Fontenay-aux-Roses, Janvier 1963.
- 113 CHARBONNEL, A. : Comparaison des mesures
effectuées au service et dans différents centres
sur des disques de Cobalt actif.
CEN, Saclay, Janvier 1963.
- 114 PROSDOCIMI, A. : Terminologie proposée pour
la compilation du rapport général de dosimétrie
(1ère édition).
Euratom, Geel, Janvier 1963.
- 115 FABRY, A. : Dosimétrie absolue de neutrons
rapides au moyen de détecteurs à seuil.
CEN-SCK, Mol, Avril 1963.
- 116 MOTTE, F., J. DEBRUE : Coupure du Cadmium
pour la norme Cobalt.
CEN-SCK, Mol, Avril 1963.

- 117 DEBRUE, J. : Contrôle de l'étalon de flux du CEN Mol par mesures absolues de feuilles d'or.
CEN-SCK, Mol, Avril 1963
- 118 KÖHLER, W. : Vergleich der berechneten und der mit Aktivierungsdetektoren gemessenen Energieabhängigkeit des Neutronenflusses.
FRM, München, März, 1963.
- 119 COMERA, J. : Utilisation du Titane comme détecteur à seuil et intégrateur de dose en neutrons rapides.
CEN, Saclay, Avril 1963.
- 120 HYVER, C. : Etude d'une possibilité de réalisation d'un détecteur sensible dans la bande 0,75 keV-5 keV
CEN, Saclay, Mars 1963.
- 121 PÖNITZ, W. : Determination of absolute thermal neutron flux by gold foils.
KBB, Karlsruhe, March 1963.
- 122 BOYER, CAMPAN, SCHMITT : Ralentissement et diffusion des neutrons issus d'une source ponctuelle dans un milieu modérateur de dimensions finies - Etude préliminaire de l'étalon de flux de Cadarache.
CEN, Cadarache, Mars 1963.
- 123 HEERTJE, I. : Fast neutron activation detectors.
IKO, Amsterdam, January 1963.
- 124 PERRIOT, G., A.P. SCHMITT : Dosimétrie des neutrons et irradiation des solides.
CEN, Saclay, Décembre 1962.

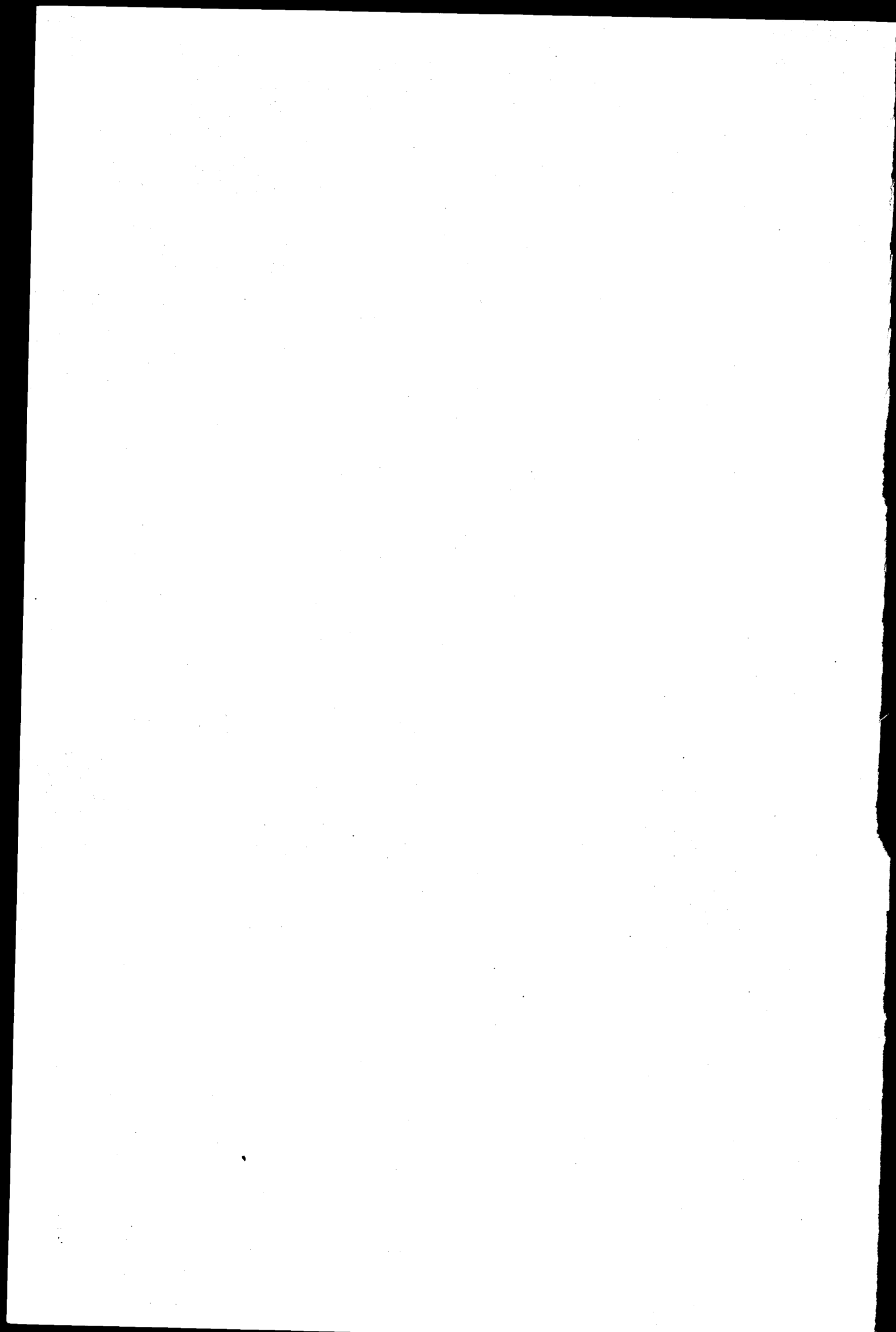
- 125 HAGEN, S. : Quasimomentane Flussmessungen mit einem Betastrahl-Rhodiumdetektor.
KBB, Karlsruhe, April 1963.
- 126 DIERCKX, R., A. GABRIELS : An enriched Uranium Converter.
Euratom, Ispra, May 1963.
- 127 PROSDOCIMI, A. : Minutes of the 9th Meeting of the Working Group ^{on} Reactor Dosimetry.
Euratom, Brussels, April 1963.
- 128 PAULSEN, A. : Minutes of the Meeting of 5th April 1963 held at the CBNM, Geel.
Euratom, Geel, April 1963.
- 129 LISKIEN, H., A. PAULSEN : Compilation of cross-sections for some neutron-induced threshold reactions.
Euratom, Geel, August 1963.
- 130 MORET, H., J. BRULMANS : Crystalline quartz samples as neutron dosimeters.
Euratom, Geel, October 1963.
- 131 DE SWINIARSKI, R., J. CZERNY : Mesure de l'activité absolue d'une source de Co^{58} par un dispositif à coïncidence.
CEN, Grenoble, Juillet 1963.
- 132 DE SWINIARSKI, R., J. CZERNY, Y. DROULERS : Mesure de la section efficace du Co^{59} aux neutrons thermiques par comparaison avec celle de l' Au^{197} .
CEN, Grenoble, Mai 1963.
- 133 CANCE, M., J. COMERA, C. HYVER : Mesure de la section efficace du Cobalt.
CEN, Saclay, Septembre 1963.

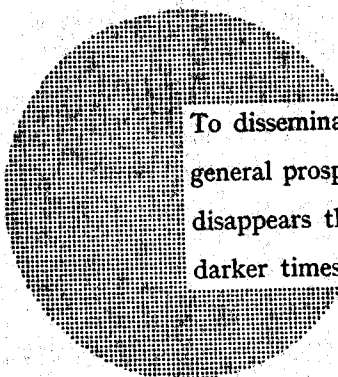
- neutrons rapides dans une cellule de pile à graphite.
CEN, Fontenay-aux-Roses, Février 1964.
- 150 MORITZ, J., H.J. TAUFFENBACH : Einfluss eines starken γ -Hintergrundes auf das Auflösungsvermögen und die Energieeichung eines Li^6F -Halbleiter-Sandwichspektrometers.
FRG, Geesthacht, Februar 1964.
- 151 LOTT, M., S. PASSE : Comparaison de spectres obtenues avec des plaques nucléaires et un spectromètre à Lithium 6.
CEN, Fontenay-aux-Roses, Février 1964.
- 152 BEETS, C., P. COLLE, H. DECKERS, G. GIERTS, S. DE LEEUW : Examen des possibilités des méthodes directes en analyse spectrale des neutrons intermédiaires et rapides.
CEN, Cadarache, Août 1963.
- 153 ATEN Jr., A.H.W. : The possibility of using the $\text{Na}^{23} (n,2n)\text{Na}^{22}$ for fast neutron flux integration.
IKO, Amsterdam, February 1964.
- 154 ATEN Jr., A.H.W. : Suggestion for a standard fast neutron flux.
IKO, Amsterdam, February 1964.
- 155 MORET, H. : Errors and Corrections.
Euratom, Geel, February 1964.
- 156 DENIS, P., R. DE SWINIARSKI : Précision et statistiques - Application aux phénomènes radioactifs.
CEN, Grenoble, Février 1964.

- 157 BORCHARDT, G., W. SCHNEIDER: Neutronenmessungen mit einem Paraffinmeiler.
KFJ, Jülich, Mai 1963.
- 158 BRINKMAN, G.A., A.H.W. ATEN Jr., J.Th. VEENBOER :
Absolute standardization with a NaI (TL) crystal.
I Calibration by means of a single nuclide.
II Determination of the total efficiency.
III Calibration of β^+ -emitters.
IKO, Amsterdam, July 1962/January 1963.
- 159 ZIJP, W.L. : Review on activation methods for the determination of neutron spectra -
Part 1 : Intermediate neutron spectra.
RCN, Petten, November 1963.
- 160 PROSDOCIMI, A. : Minutes of the 11th meeting of the working group Reactor Dosimetry.
Euratom, Brussels, April 1964.
- 161 DELATTRE, P., A. PROSDOCIMI : Les activités du groupe de travail Dosimétrie d'Euratom.
Euratom, Brussels Décembre 1963.
- 162 CAMPAN, J.L., A. PROSDOCIMI : Possibilités d'étalonnage de flux neutroniques à l'aide de chambres à fissions.
CEN, Cadarache, Juin 1964.
- 163 HEERTJE, I., N.P. VAN WESTEN, A.H.W. ATEN Jr. :
Measurement of Pu-Be neutrons with activation detectors.
IKO, Amsterdam, June 1964.
- 164 DULIEU, P. : Etat actuel de la dosimétrie des dommages par diodes au silicium.
CEN, Fontenay-aux-Roses, Juin 1964.

- 165 DIETRICH, H.O.W. : Darstellung der differentiellen
Flussdichte schneller Neutronen in leichtwasser-
moderierten Reaktoren und die Berechnung effektiver
Wirkungsquerschnitte.
PTB, Braunschweig, Juni 1964.
- 166 MANENT, G. : Problèmes particuliers à la mesure des
flux de neutrons dans les protections au moyen de
détecteurs par activation.
CEN, Fontenay-aux-Roses, Juin 1964
- 167 DROULERS, Y., G. PLEYBER, P. SCIERS, G. MAURIN :
Boucle à gaz - mesure continue de flux de neutrons
thermiques et rapides.
CEN, Grenoble, janvier 1964.
- 168 MAS, P., P. SCIERS : Mesure continue des flux de
neutrons à l'aide d'un dispositif convertisseur.
CEN, Grenoble, Avril 1964.
- 169 PROSDOCIMI, A. : Terminologie proposée pour la
compilation du rapport général de Dosimétrie
(3^{ème} édition).
EURATOM, Caradarche, Juin 1964.
- 170 KÖHLER, W., J. ROMANOS : Methode zur Verwendung
der Spaltung von U^{238} und Th^{232} durch schnelle
Neutronen für die Messung von Neutronenflüssen.
FRM, München, Januar 1963.
- 171 KÖHLER, W. : Die spektrale Verteilung der epi-
thermischen und schnellen Neutronen in Bestrahlungs-
positionen des FRM.
FRM, München, Januar 1963.
- 172 KÖHLER, W. : Die Bestimmung der energetischen
Verteilung des schnellen Neutronenflusses in
Reaktoren.
FRM, München, März 1964.

- 173 HAMMER, W., W. KÖHLER : Die Verteilung des Neutronenflusses in einer zentralen Elementlücke eines Schwimmbadreaktors.
FRM, München, März 1964.
- 174 ATEN Jr., A.H.W., G.A. BRINKMANN, I. HEERTJE, W. NAGEL : Remarks on the use of threshold detectors.
IKO, Amsterdam, 1963.
- 175 HEERTJE, I., L. DELVENNE, W. NAGEL, A.H.W. ATEN Jr. : A search for fast neutron detectors without a threshold.
IKO, Amsterdam, 1964.
- 176 HEERTJE, I., L. DELVENNE, A.H.W. ATEN Jr. : Cross-sections for the reactions $^{204}\text{Pb}(n,n')^{204\text{m}}\text{Pb}$ and $^{206}\text{Pb}(n,3n)^{204\text{m}}\text{Pb}$.
IKO, Amsterdam, 1964.
- 177 HEERTJE, I., L. DELVENNE, A.H.W. ATEN Jr. : Cross-sections of some (n,p) and (n,2n) reactions.
IKO, Amsterdam, 1964.
- 178 DELATTRE, P., K. GUBERNATOR : The activities of the Euratom Dosimetry Working Group from 1962 until 1964.
EURATOM, Geel, June 1964.





To disseminate knowledge is to disseminate prosperity — I mean general prosperity and not individual riches — and with prosperity disappears the greater part of the evil which is our heritage from darker times.

Alfred Nobel

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