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Report of the Task Group on Dose Calculations to ICRP Committee 2 October 14–17, 1980

Mary R. Ford

HEALTH AND SAFETY RESEARCH DIVISION
OAK RIDGE NATIONAL LABORATORY

OPERATED BY
UNION CARBIDE CORPORATION
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

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Health and Safety Research Division

REPORT OF THE TASK GROUP ON DOSE CALCULATIONS TO ICRP COMMITTEE 2

October 14-17, 1980

Mary R. Ford

Date Published - February 1981

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OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37830
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DEPARTMENT OF ENERGY

CONTENTS

REPORT OF THE TASK GROUP ON DOSE CALCULATIONS TO ICRP COMMITTEE 2, OCTOBER 14-17, 1980

DOSIMETRIC DATA FOR PART 2 OF PUBLICATION 30

Following the meeting of the Committee in March at Brighton, England, the Task Group directed its efforts toward completion of data for Part 2 of Publication 30 pursuant to decisions taken at the meeting. The following items were involved:

1. The Commission's decision to reduce the dose limit for lens of the eye from 0.3 Sv to 0.15 Sv resulted in recalculation of dosimetric data in Part 2 for isotopes of argon and xenon. The data for krypton already published in Part 1 and its Supplement were recalculated also, and it was found that the revision would change the derived air concentration (DAC) values for two of the iostopes, Kr-81 and Kr-83*m*.
2. The agreement to accept the preliminary calculation for Ar-37 limited by dose to lungs in a manner similar to tritium required special computer formatting of the results.
3. The error noted in the units appearing in the heading of the specific effective energy (SEE) tables for submersion was corrected in the code [i.e., (MeV/g)/(Bq/m^3) was changed to (MeV/g)/(transformation/m^3)], and amended headings were furnished for Parts 1 and 2.
4. The decision by the Committee to change the fractional uptake from the gastrointestinal tract to body fluids (f_1) for promethium from 1×10^{-4} to 3×10^{-4} necessitated the recalculation of dosimetric data for isotopes of promethium.

DOSIMETRIC DATA FOR PART 3 OF PUBLICATION 30

The revised metabolic models provided by M. Thorne (Associated Nuclear Services, Epsom, Surrey, England) for the 43 remaining elements (ANS-212) arrived in late May. Like the previous models they are explicit and easy to interpret for computational purposes. The few questions that arose have been settled by correspondence. To date the Task Group has completed the computations of dosimetric data for 37 of the 44 elements (including promethium, which was held over from Part 2) to be included in Part 3. This corresponds to about 300 radionuclides out of a total of approximately 320 envisioned for the publication. The decay chains for all the nuclides have been drawn by computer from the nuclear decay data base in a form suitable for use by the Task Group, but production of the final publication-quality drawings awaits a time nearer to publication date (to avoid possible damage in storage).

REPORT BY THE TASK GROUP

The text of the separate report by the Task Group on radioactive decay data is submitted in draft form for discussion (ICRP/80/C2-26). The report was written by L. T. Dillman of the Task Group on Dose Calculations. He is responsible also for the computer code that accepts the Evaluated Nuclear Structure Data File (ENSDF) of nuclear decay data from the ORNL Nuclear Data Project and computes the detailed breakdown of xrays, Auger electrons, etc., needed for making dose estimates. Additionally, he has furnished the code for drawing the decay chains of parent-daughter radionuclides that appear in the supplement as well as a further code for drawing the decay schemes to be included in the decay data publication. Other members of the Task Group have supplied valuable input to the project in the form of suggestions and detailed checking of many sample cases for each code. In particular, S. Watson (Computer Sciences Division, ORNL) has provided expert assistance in on-site coding and computer operation. L. T. Dillman participates principally from Ohio Weslsyan University although all the graphics and output data will be generated at ORNL.

Previous Task Group reports have contained discussions of the nuclear decay data publication, and certain agreements have been reached concerning the format and contents. To limit the size of the volume, it was agreed at the last meeting to include only output data, to omit transitions that contribute less than 0.1% to the total, and to omit data for daughter members of a decay chain that contribute less than 0.1% to the weighted committed dose equivalent. Altogether, data for approximately 800 radionuclides consisting of as many as ten pages for each radionuclide are to be included. We are seeking ways to further condense the data.

A table similar to Table 1 was presented at the last meeting as an example of the approved format. In Table 2, the condensed version we are proposing is shown for the same radionuclide. By abbreviating the types of radiations, the output is structured in a manner suitable for publication on a half-page width after reduction. To restrict the length of the output, a cutoff which permits selection of a variable number of lines has been built into the code. At present the number of lines is set so that no more than three pages of output will be generated. Specifically:

Table 1.

OUTPUT DATA

120-IODINE-53 HALFLIFE = 81 MINUTES 06-26-80

MODES OF DECAY: ELECTRON CAPTURE, BETA PLUS

TYPE OF RADIATION	ID NO.	MEAN NUMBER/ TRANSFOR-MATION	ENERGY (MEV)	MEV/ TRANSFOR-MATION
BETA PLUS	1	6.59E-03	6.572E-01*	4.33E-03
BETA PLUS	2	7.49E-03	7.417E-01*	5.56E-03
BETA PLUS	3	1.15E-02	1.120E 00*	1.29E-02
BETA PLUS	4	8.19E-02	1.131E 00*	9.27E-02
BETA PLUS	5	1.60E-02	1.233E 00*	1.97E-02
BETA PLUS	6	8.09E-02	1.542E 00*	1.25E-01
BETA PLUS	7	3.30E-02	1.561E 00*	5.15E-02
BETA PLUS	8	7.69E-03	1.588E 00*	1.22E-02
BETA PLUS	9	3.78E-01	1.845E 00*	6.97E-01
BETA PLUS	10	1.90E-01	2.099E 00*	3.98E-01
ANNIHILATION RADIATION		1.62E 00	5.110E-01	8.30E-01
GAMMA-RAY	4	1.09E-02	5.427E-01	5.94E-03
GAMMA-RAY	5	7.30E-01	5.604E-01	4.09E-01
K CONV. ELECTRON, GAMMA-RAY	5	3.71E-03	5.286E-01	1.96E-03
GAMMA-RAY	6	5.77E-02	6.011E-01	3.47E-02
GAMMA-RAY	7	6.57E-03	6.140E-01	4.03E-03
GAMMA-RAY	8	9.12E-02	6.411E-01	5.85E-02
GAMMA-RAY	11	1.12E-02	6.621E-01	7.44E-03
GAMMA-RAY	23	3.65E-03	8.818E-01	3.22E-03
GAMMA-RAY	25	6.93E-03	9.213E-01	6.39E-03
GAMMA-RAY	27	1.61E-02	9.751E-01	1.57E-02
GAMMA-RAY	28	3.87E-03	9.796E-01	3.79E-03
GAMMA-RAY	29	5.11E-03	1.039E 00	5.31E-03
GAMMA-RAY	31	4.09E-03	1.101E 00	4.50E-03
GAMMA-RAY	33	4.38E-03	1.158E 00	5.07E-03
GAMMA-RAY	34	5.84E-03	1.169E 00	6.83E-03
GAMMA-RAY	35	1.93E-02	1.202E 00	2.32E-02
GAMMA-RAY	37	8.03E-03	1.255E 00	1.01E-02
GAMMA-RAY	38	3.65E-03	1.283E 00	4.68E-03
GAMMA-RAY	39	4.23E-03	1.299E 00	5.50E-03
GAMMA-RAY	40	8.25E-03	1.303E 00	1.07E-02
GAMMA-RAY	41	6.57E-03	1.363E 00	8.96E-03
GAMMA-RAY	42	5.11E-03	1.383E 00	7.07E-03
GAMMA-RAY	43	1.31E-02	1.411E 00	1.85E-02
GAMMA-RAY	45	8.03E-03	1.423E 00	1.14E-02
GAMMA-RAY	47	2.19E-03	1.441E 00	3.16E-03
GAMMA-RAY	48	5.11E-03	1.452E 00	7.42E-03
GAMMA-RAY	49	4.38E-03	1.492E 00	6.53E-03
GAMMA-RAY	50	1.12E-01	1.523E 00	1.71E-01
GAMMA-RAY	51	2.04E-02	1.535E 00	3.14E-02
GAMMA-RAY	52	1.17E-02	1.543E 00	1.80E-02
GAMMA-RAY	53	9.12E-03	1.547E 00	1.41E-02
GAMMA-RAY	54	3.65E-03	1.552E 00	5.67E-03
GAMMA-RAY	55	7.30E-03	1.605E 00	1.17E-02
GAMMA-RAY	56	3.65E-03	1.664E 00	6.07E-03
GAMMA-RAY	57	5.11E-03	1.674E 00	8.55E-03
GAMMA-RAY	58	6.57E-03	1.761E 00	1.16E-02
GAMMA-RAY	59	5.11E-03	1.764E 00	9.01E-03
GAMMA-RAY	60	2.19E-03	1.769E 00	3.87E-03

Table 1 (Continued)

OUTPUT DATA (CONTINUED)

120-IODINE-53 HALFLIFE = 81 MINUTES 06-26-80

MODES OF DECAY: ELECTRON CAPTURE, BETA PLUS

TYPE OF RADIATION	ID NO.	MEAN NUMBER/ TRANSFORMATION	ENERGY (MEV)	KEV/ TRANSFORMATION
GAMMA-RAY	61	8.25E-03	1.776E 00	1.46E-02
GAMMA-RAY	62	1.31E-02	1.790E 00	2.35E-02
GAMMA-RAY	64	2.63E-03	1.851E 00	4.87E-03
GAMMA-RAY	65	5.84E-03	1.868E 00	1.09E-02
GAMMA-RAY	66	5.84E-03	1.875E 00	1.09E-02
GAMMA-RAY	67	5.84E-03	1.895E 00	1.11E-02
GAMMA-RAY	68	5.84E-03	1.911E 00	1.12E-02
GAMMA-RAY	69	2.92E-03	1.923E 00	5.61E-03
GAMMA-RAY	70	2.92E-03	1.935E 00	5.65E-03
GAMMA-RAY	71	4.38E-03	1.983E 00	8.69E-03
GAMMA-RAY	72	3.65E-03	2.034E 00	7.42E-03
GAMMA-RAY	73	2.19E-03	2.045E 00	4.48E-03
GAMMA-RAY	74	9.49E-03	2.082E 00	1.98E-02
GAMMA-RAY	75	3.65E-03	2.094E 00	7.64E-03
GAMMA-RAY	76	5.47E-03	2.109E 00	1.15E-02
GAMMA-RAY	77	8.03E-03	2.129E 00	1.71E-02
GAMMA-RAY	78	3.65E-03	2.142E 00	7.82E-03
GAMMA-RAY	79	3.65E-03	2.158E 00	7.88E-03
GAMMA-RAY	80	7.30E-03	2.172E 00	1.59E-02
GAMMA-RAY	81	5.11E-03	2.181E 00	1.11E-02
GAMMA-RAY	82	1.39E-02	2.188E 00	3.03E-02
GAMMA-RAY	83	2.19E-03	2.218E 00	4.86E-03
GAMMA-RAY	84	2.92E-03	2.305E 00	6.73E-03
GAMMA-RAY	85	3.65E-03	2.375E 00	8.67E-03
GAMMA-RAY	86	4.82E-03	2.378E 00	1.15E-02
GAMMA-RAY	87	1.02E-02	2.404E 00	2.46E-02
GAMMA-RAY	88	2.04E-02	2.455E 00	5.02E-02
GAMMA-RAY	89	6.57E-03	2.463E 00	1.62E-02
GAMMA-RAY	90	1.02E-02	2.492E 00	2.55E-02
GAMMA-RAY	91	2.92E-03	2.510E 00	7.33E-03
GAMMA-RAY	92	2.92E-03	2.526E 00	7.38E-03
GAMMA-RAY	93	1.96E-02	2.564E 00	5.04E-02
GAMMA-RAY	95	5.11E-03	2.602E 00	1.33E-02
GAMMA-RAY	96	2.19E-03	2.638E 00	5.78E-03
GAMMA-RAY	97	2.19E-03	2.654E 00	5.81E-03
GAMMA-RAY	98	3.65E-03	2.697E 00	9.84E-03
GAMMA-RAY	99	4.38E-03	2.740E 00	1.20E-02
GAMMA-RAY	100	2.92E-03	2.747E 00	8.02E-03
GAMMA-RAY	101	3.65E-03	2.778E 00	1.01E-02
GAMMA-RAY	102	2.92E-03	2.800E 00	8.18E-03
GAMMA-RAY	103	6.57E-03	2.811E 00	1.85E-02
GAMMA-RAY	104	2.19E-03	2.829E 00	6.20E-03
GAMMA-RAY	105	3.65E-03	2.864E 00	1.05E-02
GAMMA-RAY	106	7.01E-03	2.933E 00	2.06E-02
GAMMA-RAY	107	2.92E-03	2.939E 00	8.58E-03
GAMMA-RAY	108	4.38E-03	2.987E 00	1.31E-02
GAMMA-RAY	109	3.65E-03	3.029E 00	1.11E-02
GAMMA-RAY	110	1.31E-02	3.047E 00	4.00E-02
GAMMA-RAY	111	2.92E-03	3.082E 00	9.00E-03

Table 1 (Continued)

OUTPUT DATA (CONTINUED)

120-IODINE-53 HALFLIFE = 81 MINUTES 06-26-80

MODES OF DECAY: ELECTRON CAPTURE, BETA PLUS

TYPE OF RADIATION	ID NO.	MEAN NUMBER/ TRANSFOR-MATION	ENERGY (MEV)	MEV/ TRANSFOR-MATION
GAMMA-RAY	112	3.65E-03	3.098E 00	1.13E-02
GAMMA-RAY	113	3.65E-03	3.105E 00	1.13E-02
GAMMA-RAY	114	2.19E-03	3.160E 00	6.92E-03
GAMMA-RAY	115	6.57E-03	3.182E 00	2.09E-02
GAMMA-RAY	116	2.19E-03	3.334E 00	7.30E-03
GAMMA-RAY	117	2.92E-03	3.395E 00	9.91E-03
GAMMA-RAY	118	2.19E-03	3.442E 00	7.54E-03
GAMMA-RAY	119	2.92E-03	3.545E 00	1.04E-02
GAMMA-RAY	120	2.92E-03	3.580E 00	1.05E-02
GAMMA-RAY	121	6.57E-03	3.608E 00	2.37E-02
GAMMA-RAY	122	2.92E-03	3.694E 00	1.08E-02
GAMMA-RAY	123	2.92E-03	3.742E 00	1.09E-02
GAMMA-RAY	124	2.92E-03	4.120E 00	1.20E-02
GAMMA-RAY	125	2.92E-03	4.134E 00	1.21E-02
GAMMA-RAY	126	2.92E-03	4.148E 00	1.21E-02
GAMMA-RAY	127	2.92E-03	4.188E 00	1.22E-02
GAMMA-RAY	128	2.19E-03	4.283E 00	9.38E-03
GAMMA-RAY	129	2.19E-03	4.288E 00	9.39E-03
GAMMA-RAY	130	1.46E-03	4.413E 00	6.44E-03

ALL LISTED X-RAYS, GAMMA-RAYS AND ANNIHILATION RADIATION	2.70E 00
ALL NEGLECTED X-RAYS, GAMMA-RAYS AND ANNIH. RADIATION**	3.34E-02
ALL LISTED BETAS, INTERNAL CONVERSION AND AUGER ELECTRONS	1.42E 00
ALL NEGLECTED BETAS, INT. CONVERSION AND AUGER ELECTRONS**	2.72E-03
ALL LISTED RADIATIONS	4.12E 00
ALL NEGLECTED RADIATIONS**	3.61E-02

* AVERAGE ENERGY (MEV)

** EACH NEGLECTED TRANSITION CONTRIBUTES LESS THAN 0.100% TO THE TOTAL MEV/TRANSFORMATION FOR THIS CATEGORY.

DAUGHTER NUCLIDE, 120-TELLURIUM GROUND STATE, IS STABLE.

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INPUT DATA SOURCE: EVALUATED NUCLEAR STRUCTURE DATA FILE (ENSDF)
NUCLEAR DATA PROJECT, OAK RIDGE NATIONAL LABORATORY.
DATE INPUT DATA WERE ENTERED INTO ENSDF: 17-SEP-75

Table 2.

120-IODINE-53

HALFLIFE = 81 MINUTES 17-SEP-75
DECAY MODE(S): EC, β+

RADIATION	n(i)	E(i)	n(i)*E(i)
β+ 1	6.59E-03	6.572E-01*	4.33E-03
β+ 2	7.49E-03	7.417E-01*	5.56E-03
β+ 3	1.15E-02	1.120E 00*	1.29E-02
β+ 4	8.19E-02	1.131E 00*	9.27E-02
β+ 5	1.60E-02	1.233E 00*	1.97E-02
β+ 6	8.09E-02	1.542E 00*	1.25E-01
β+ 7	3.30E-02	1.561E 00*	5.15E-02
β+ 8	7.69E-03	1.588E 00*	1.22E-02
β+ 9	3.78E-01	1.845E 00*	6.97E-01
β+ 10	1.90E-01	2.099E 00*	3.98E-01
γ±	1.62E 00	5.110E-01	8.30E-01
γ 4	1.09E-02	5.427E-01	5.94E-03
γ 5	7.30E-01	5.604E-01	4.09E-01
ce-K, γ 5	3.71E-03	5.286E-01	1.96E-03
γ 6	5.77E-02	6.011E-01	3.47E-02
γ 7	6.57E-03	6.140E-01	4.03E-03
γ 8	9.12E-02	6.411E-01	5.85E-02
γ 11	1.12E-02	6.621E-01	7.44E-03
γ 23	3.65E-03	8.818E-01	3.22E-03
γ 25	6.93E-03	9.213E-01	6.39E-03
γ 27	1.61E-02	9.751E-01	1.57E-02
γ 28	3.87E-03	9.796E-01	3.79E-03
γ 29	5.11E-03	1.039E 00	5.31E-03
γ 31	4.09E-03	1.101E 00	4.50E-03
γ 33	4.38E-03	1.158E 00	5.07E-03
γ 34	5.84E-03	1.169E 00	6.83E-03
γ 35	1.93E-02	1.202E 00	2.32E-02
γ 37	8.03E-03	1.255E 00	1.01E-02
γ 38	3.65E-03	1.283E 00	4.68E-03
γ 39	4.23E-03	1.299E 00	5.50E-03
γ 40	8.25E-03	1.303E 00	1.07E-02
γ 41	6.57E-03	1.363E 00	8.96E-03
γ 42	5.11E-03	1.383E 00	7.07E-03
γ 43	1.31E-02	1.411E 00	1.85E-02
γ 45	8.03E-03	1.423E 00	1.14E-02
γ 47	2.19E-03	1.441E 00	3.16E-03
γ 48	5.11E-03	1.452E 00	7.42E-03
γ 49	4.38E-03	1.492E 00	6.53E-03
γ 50	1.12E-01	1.523E 00	1.71E-01
γ 51	2.04E-02	1.535E 00	3.14E-02
γ 52	1.17E-02	1.543E 00	1.80E-02
γ 53	9.12E-03	1.547E 00	1.41E-02
γ 54	3.65E-03	1.552E 00	5.67E-03
γ 55	7.30E-03	1.605E 00	1.17E-02
γ 56	3.65E-03	1.664E 00	6.07E-03
γ 57	5.11E-03	1.674E 00	8.55E-03
γ 58	6.57E-03	1.761E 00	1.16E-02
γ 59	5.11E-03	1.764E 00	9.01E-03
γ 60	2.19E-03	1.769E 00	3.87E-03
γ 61	8.25E-03	1.776E 00	1.46E-02
γ 62	1.31E-02	1.790E 00	2.35E-02
γ 64	2.63E-03	1.851E 00	4.87E-03
γ 65	5.84E-03	1.868E 00	1.09E-02

Table 2 (Continued)

γ 66	5.84E-03	1.875E 00	1.09E-02
γ 67	5.84E-03	1.895E 00	1.11E-02
γ 68	5.84E-03	1.911E 00	1.12E-02
γ 69	2.92E-03	1.923E 00	5.61E-03
γ 70	2.92E-03	1.935E 00	5.65E-03
γ 71	4.38E-03	1.983E 00	8.69E-03
γ 72	3.65E-03	2.034E 00	7.42E-03
γ 73	2.19E-03	2.045E 00	4.48E-03
γ 74	9.49E-03	2.082E 00	1.98E-02
γ 75	3.65E-03	2.094E 00	7.64E-03
γ 76	5.47E-03	2.109E 00	1.15E-02
γ 77	8.03E-03	2.129E 00	1.71E-02
γ 78	3.65E-03	2.142E 00	7.82E-03
γ 79	3.65E-03	2.158E 00	7.88E-03
γ 80	7.30E-03	2.172E 00	1.59E-02
γ 81	5.11E-03	2.181E 00	1.11E-02
γ 82	1.39E-02	2.188E 00	[illegible]
γ 83	2.19E-03	2.218E 00	[illegible]
γ 84	2.92E-03	2.305E 00	6.73E-03
γ 85	3.65E-03	2.375E 00	8.67E-03
γ 86	4.82E-03	2.378E 00	1.15E-02
γ 87	1.02E-02	2.404E 00	2.46E-02
γ 88	2.04E-02	2.455E 00	5.02E-02
γ 89	6.57E-03	2.463E 00	1.62E-02
γ 90	1.02E-02	2.492E 00	2.55E-02
γ 91	2.92E-03	2.510E 00	7.33E-03
γ 92	2.92E-03	2.526E 00	7.38E-03
γ 93	1.96E-02	2.564E 00	5.04E-02
γ 95	5.11E-03	2.602E 00	1.33E-02
γ 96	2.19E-03	2.638E 00	5.78E-03
γ 97	2.19E-03	2.654E 00	5.81E-03
γ 98	3.65E-03	2.697E 00	9.84E-03
γ 99	4.38E-03	2.740E 00	1.20E-02
γ 100	2.92E-03	2.747E 00	8.02E-03
γ 101	3.65E-03	2.778E 00	1.01E-02
γ 102	2.92E-03	2.800E 00	8.18E-03
γ 103	6.57E-03	2.811E 00	1.85E-02
γ 104	2.19E-03	2.829E 00	6.20E-03
γ 105	3.65E-03	2.864E 00	1.05E-02
γ 106	7.01E-03	2.933E 00	2.06E-02
γ 107	2.92E-03	2.939E 00	8.58E-03
γ 108	4.38E-03	2.987E 00	1.31E-02
γ 109	3.65E-03	3.029E 00	1.11E-02
γ 110	1.31E-02	3.047E 00	4.00E-02
γ 111	2.92E-03	3.082E 00	9.0[illegible]E-03
γ 112	3.65E-03	3.098E 00	1.13E-02
γ 113	3.65E-03	3.105E 00	1.13E-02
γ 114	2.19E-03	3.160E 00	6.92E-03
γ 115	6.57E-03	3.182E 00	2.09E-02
γ 116	2.19E-03	3.334E 00	7.30E-03
γ 117	2.92E-03	3.395E 00	9.91E-03
γ 118	2.19E-03	3.442E 00	7.54E-03
γ 119	2.92E-03	3.545E 00	1.04E-02
γ 120	2.92E-03	3.580E 00	1.05E-02
γ 121	6.57E-03	3.608E 00	2.37E-02
γ 122	2.92E-03	3.694E 00	1.08E-02
γ 123	2.92E-03	3.742E 00	1.09E-02
γ 124	2.92E-03	4.120E 00	1.20E-02
γ 125	2.92E-03	4.134E 00	1.21E-02
γ 126	2.92E-03	4.148E 00	1.21E-02

Table 2 (Continued)

γ 127	2.92E-03	4.188E 00	1.22E-02
γ 128	2.19E-03	4.283E 00	9.38E-03
γ 129	2.19E-03	4.288E 00	9.39E-03
γ 130	1.46E-03	4.413E 00	6.44E-03

LISTED X,γ AND γ± RADIATIONS	2.70E 00
OMITTED X,γ AND γ± RADIATIONS**	3.34E-02
LISTED β,ce AND Auger RADIATIONS	1.42E 00
OMITTED β,ce AND Auger RADIATIONS**	2.72E-03
LISTED RADIATIONS	4.12E 00
OMITTED RADIATIONS**	3.61E-02

* AVERAGE ENERGY (MEV)
** EACH OMITTED TRANSITION CONTRIBUTES
<0.100% TO THE Σn(i)*E(i).
120-TELLURIUM DAUGHTER IS STABLE.

1. If the output is no more than one page, no cutoff is applied.
2. If the output would be more than one page, a cutoff at 0.1% of the total energy emitted per disintegration is used.
3. If the output would be more than three pages with the 0.1% cutoff, the output is limited to three pages.

Tests on several radionuclides that would produce more than three pages with a 0.1% cutoff have, when limited to three pages, shown a cutoff no greater than 0.2%.

As for the decay schemes, each is drawn to scale for a particular decay mode. The drawings correspond to the output data, except that some emissions may be listed that are not shown on the drawings. This occurs because it is not known at this time where some of the emissions fit into the scheme. Thus, the number of gammas, for example, on the drawing will usually be the same or less than the number of gammas in the output. There are a few exceptions where a gamma is shown on the drawing but is not listed in the output. In these cases internal conversion has occurred, and the intensity of the conversion electron has met the criterion for inclusion in the output but the associated gamma has not.

Many drawings, such as the one shown in Fig. 1 for I-125, can be reduced to a one-column width. Other schemes like the one in Fig. 2 for I-124 will require the width of a full page, but the table of output could appear beneath the drawing in two columns. In this way, the data in the publication could all be viewed vertically, that is, in the normal manner without turning the volume horizontally. Also, considerably more data could be included per page, which should be enough to limit the volume to a reasonable size.

ORNL DWG. 81-5397

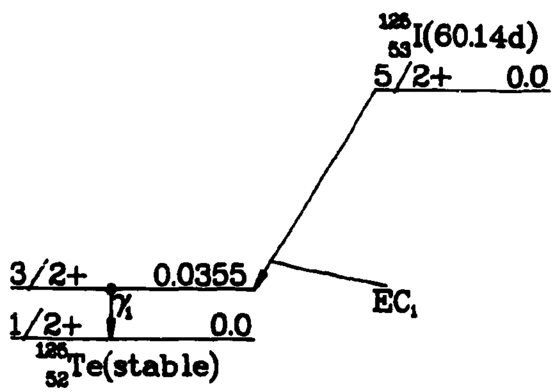

Fig. 1. Decay scheme of I-125.

ORNL DWG. 81-5398

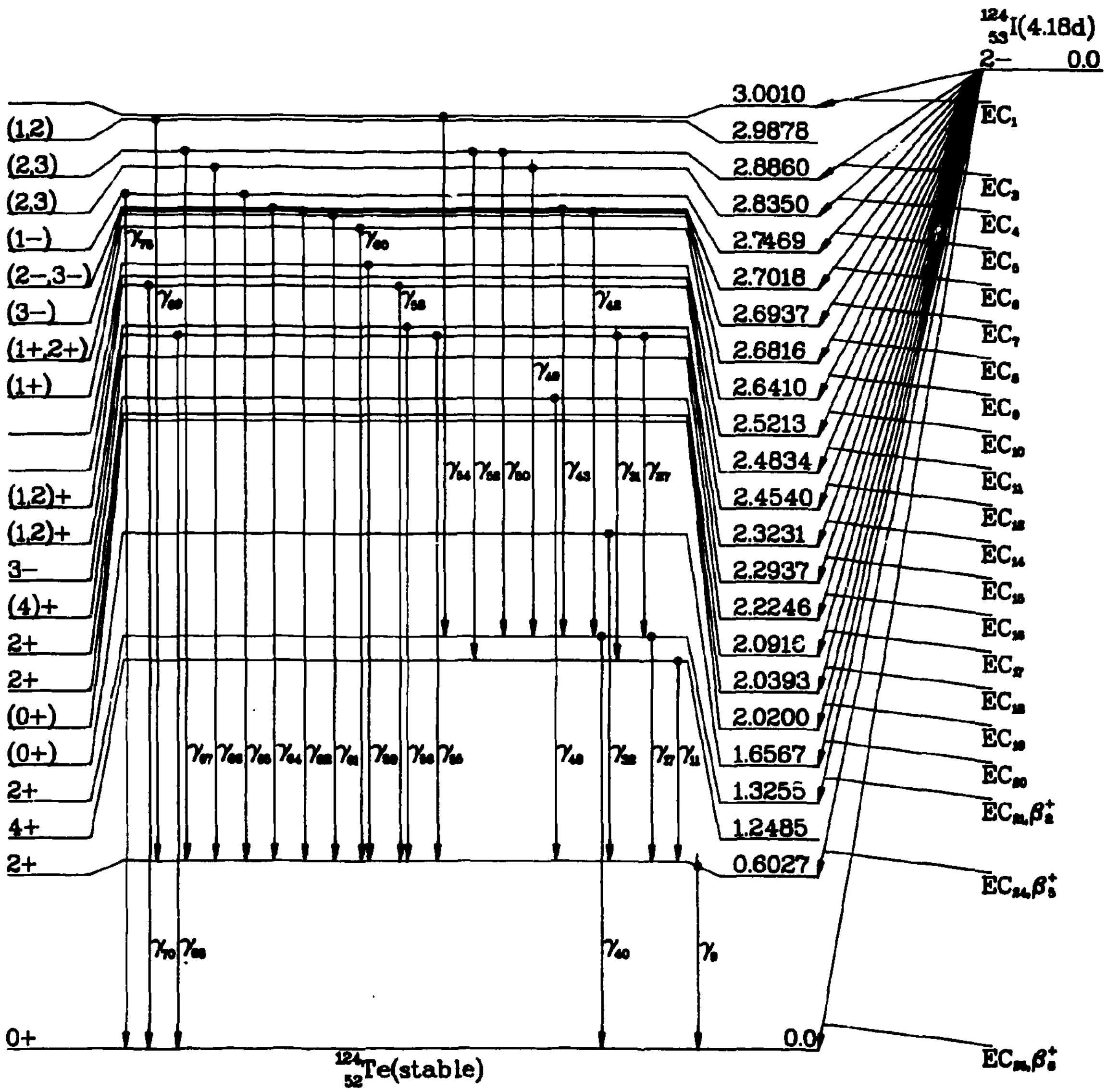

Fig. 2. Decay scheme of I-124.

A matter that may require futher consideration is whether to include decay data for members of decay chains that do not contribute to the dose (i.e., those that fail to contribute as much as 0.1% to the total weighted committed dose equivalent). Based on the projected size of the document, the decision has been to omit them, but a scrutiny of the data reveals that inclusion of data for all members of the decay chains drawn in the supplement would increase the number by only about 20 (i.e., from about 800 to 820). Perhaps with the anticipated reduction in the volume size, as noted above, these additional members can be included.

ACTIVITIES OF THE TASK GROUP NOT DIRECTLY RELATED TO PUBLICATION 30 OR THE TASK GROUP REPORT

Interaction with the ORNL Information Division and the Computer Sciences Division has been directed toward structuring and adding material to the ORNL/ICRP Data Management System. The Information Division, with the guidance of C. R. Richmond, Associate Laboratory Director for Biological and Environmental Sciences, is in charge of the systêm and will answer user requests for Publication 30 and additional biological information. These data include metabolic information, bibliographic data, ALI and DAC values, and access information to the unabridged numerical data.

The Computer Sciences Division has assisted the Task Group in organizing the unabridged numerical data bases. In particular, the assistance of N. B. Gove is appreciated. Due to the immense amount of data involved, the information storage and retrieval codes he has designed are of the utmost importance to the project. The data bases contain information needed to produce the dosimetric data for Publication 30 as well as complete sets of information from which the abbreviated tables in Publication 30 are taken. They consist of: (1) nuclear decay input data; (2) nuclear decay output data; (3) beta spectra, bremsstrahlung, and decay scheme plotting information; (4) SEE values for the complete matrix of source and target organs; and (5) dose values for all source and target organs.

The system is designed to accommodate revisions of both Publication 30 information and the unabridged numerical data. At present it provides for computing dose to adults only, and the scheme for updating the metabolic data refers only to values for adults. However, plans are developing to add similar capabilities for storing and retrieving data for children of various ages. These data will include specific absorbed fractions and SEE values for phantoms representing children and metabolic models for all age groups.

At the Brighton meeting B. Nosslin (Allmänna Sjukhuset, Diagnostiska Isotoplaboratoriet, Malmö, Sweden) and N. Veall (Clinical Research Centre, Radioisotopes Division, Harrow, Middlesex, England), of the Task Group on Dose to Patients from Radiopharmaceuticals, requested S values, as defined in the MIRD pamphlets, for the list of radionuclides to be included in their report. These were to be computed using the methodology of Publication 30 and the same decay data used in that publication. Following the meeting, agreement was reached through correspondence regarding which source and target organs to include, the type of listing (e.g., whether to list total values or to give a breakdown of contributions from different types of radiations), the inclusion of data for volume and/or surface seekers, etc. Data, both hard copies and a tape with explanatory material for reading the tape, have been furnished for 73 radionuclides.

T. Smith (Clinical Research Centre, Radioisotopes Division, Harrow, Middlesex, England) of the radiopharmaceutical group requested output decay data for 14 radionuclides of special interest regarding dose estimates to the bladder wall. These were furnished in hard copy with the intensity/ energy cutoff as defined for the decay data publication.

CONCERNS FOR THE FUTURE

A few issues remain concerning the generation of data for Part 3 and for possible additional compilations of related data that the Task Group should like the Committee to consider. These issues include:

1. The progress report (ICRP/80/C2-19) from the Chairman following the Brighton meeting states that "Values of ALI for some additional isotopes of the elements listed in Part 1 will be given in Part 3." The Task Group needs a list of the additional isotopes to be included. At an earlier meeting of the Committee, mention was made that the list of isotopes of polonium did not include all those of interest to health physicists--perhaps these should be added? Also decay data for In-107 (Tr = 32.7 m) have become available since the indium values were computed. Does the Committee approve its addition? Others?
2. Are there radionuclides of half-life less than 10 min for which submersion dose should be included? Both N-13 and O-15 are included in this group of radionuclides.

3. Are there elements other than mercury, nickel, and sulfur for which dose estimates for gases and/or vapors are needed? Iodine is an example of this type of element.
4. The only nobelium isotope with a half-life of 10 min or greater for which decay data are available from the Evaluated Nuclear Structure Data File (ENSDF) is 58 min nobelium-259. It decays by 5 known alpha branches. The intensities of any gamma transitions in the daughter nuclide are unknown. Whether this nuclide decays by beta decay and/or by spontaneous fission is likewise unknown. If these data become available on an updated ENSDF file, No-259 will be included. If they are not readily available, should a literature search for more complete data be undertaken or shall nobelium be omitted from the list of elements?
5. Would a handbook containing a computer-output list of just the ALI and DAC values ordered by atomic number be desirable? Should this be a Committee or a Task Group report? Would the demand for such a publication be great enough to interest Pergamon Press?
6. Will the Task Group be asked to compute ALIs for members of the public for a few radionuclides either as an aid to the Committee in deciding on the magnitude of correction factors or to serve as actual recommendations for radionuclides of greatest importance?

ACKNOWLEDGEMENTS

The members of the Task Group gratefully acknowledge the continued approval and support of the Committee members in carrying out this work. In particular, the assistance of the Committee chairman, J. Vennart, in coordinating the Group's efforts with Committee directives is greatly appreciated as is the on-site interest and encouragement of C. R. Richmond.

The Group is grateful to those at ORNL who have provided administrative support for the project. The administrative staff of the Health and Safety Research Division (HASRD) during this phase of the work has consisted of: K. F. Eckerman, leader of the Metabolism and Dosimetry Group; D. C. Parzyck, head of the Health Studies Section; S. V. Kaye, Director of HASRD; and C. R. Richmond, ORNL Associate Laboratory Director for Biomedical and Environmental Sciences.

COMPOSITION OF THE TASK GROUP

The task group membership during this period was: M. R. Ford, Chairman, K. F. Eckerman, and S. R. Bernard, HASRD, ORNL; S. B. Watson, Computer Sciences Division, ORNL; and L. T. Dillman, consultant to HASRD, Ohio Wesleyan University.