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The Calculation of Dose from External Photon Exposures Using Reference Human Phantoms and Monte Carlo Methods Part III: Organ Doses in X-Rays Diagnosis

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Part III: Organ Doses in X-Ray Diagnosis

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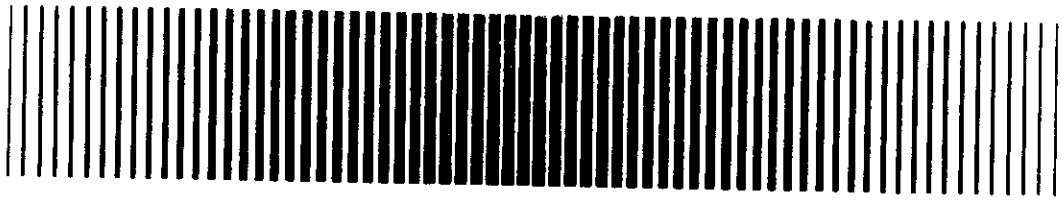

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PART III: ORGAN DOSES IN X-RAY DIAGNOSIS

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Radiation Protection in Medical Diagnosis

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ABSTRACT

This report gives tables of conversion factors for the calculation of organ doses from technical parameters of typical radiographic techniques.

These conversion factors were calculated using a male and a female mathematical human phantom and an efficient Monte Carlo programme that determines the mean organ doses from the energy deposited in each organ.

Each diagnostic X-ray examination is studied using three X-ray spectra resulting from three different high tension values. The conversion factors per unit entrance air dose in free air are given for sixteen organs and for the entrance and exit surface skin doses.

The tables are actually valid only for the given parameters such as phantom dimensions, source-to-skin distance, projection and X-ray quality. This, of course, gives rise to some uncertainty when dealing with the individual technique and patient.

The uncertainty in organ dose of adult patients, however, should not be very large, if the calculation is based on a similar geometry, and before all, on the actually administered entrance air dose in the selected high tension range according to the patient parameters.

Introduction

The determination or at least a realistic estimation of the dose to the patient in X-ray diagnosis is important in connection with radiation protection of the patient and in all attempts to optimise X-ray diagnostic methods. However, the question concerning the magnitude of patient exposure for a certain X-ray examination cannot be answered in a simple way by just loosely figuring out a dose value. There are difficulties arising mainly from two reasons: The different concepts for describing dose to the patient, and the strong influence of physical parameters on dose to the patient.

1. Concepts

In the course of time a number of quantities and expressions have been used or are still used to describe the patient's exposure.

1.1 Entrance dose, surface dose, dose-area-product

These quantities can be determined by measurements. Although closely correlated with the exposure to the patient, they do not represent it. Their use, however, may be reasonable to describe the influence of apparative or methodical measures on the patient's exposure, because in most cases a reduction of these dose values is accompanied by a decrease in the overall exposure of the patient.

1.2 Organ doses

More directly, a radiation risk to the patient is expressed by the organ doses. Organ dose means the amount of energy imparted to an organ by radiation divided by the total mass of the organ. The knowledge of organ doses is essential for risk analysis concerning the occurrence of radiation induced injuries /1/. Additional importance is attached to the embryo dose, as measures may be indicated to prevent certain dose levels being exceeded /2/.

1.3 Absorbed energy, effective dose, significant dose

As several organs are involved in X-ray examinations it sometimes seems desirable to express the total risk by means of a single effective dose value. Various concepts had been developed, partially in accordance with concepts applied in occupational radiation protection /3, 4/. The usefulness of these quantities is still under discussion.

2. Influence of physical parameters

The rather poor level of standardisation in radiological examination techniques results in a comparatively high uncertainty of evaluated patient doses. This is the reason why values quoted in literature cannot simply be transferred to individual patients. The most important physical parameters affecting patient exposures are:

2.1 Patient thickness

Depending on tube voltage, filtration and the tissue considered, about 2 - 6 cm of tissue represent a half value layer. As the image detecting systems demand constant dose values in each case, an increase in patient thickness by one half-value-layer causes approximately a doubling of entrance dose. This again increases the organ doses by up to a factor of two, depending on the depth at which the organ of interest is located. This is illustrated in Figure 1 /5/. Although depth-dose curves obtained from measurements in a homogeneous water phantom cannot exactly represent the situation in a patient, the strong interdependance of patient thickness and entrance dose is illustrated and has to be kept in mind when applying the conversion factors to a real patient.

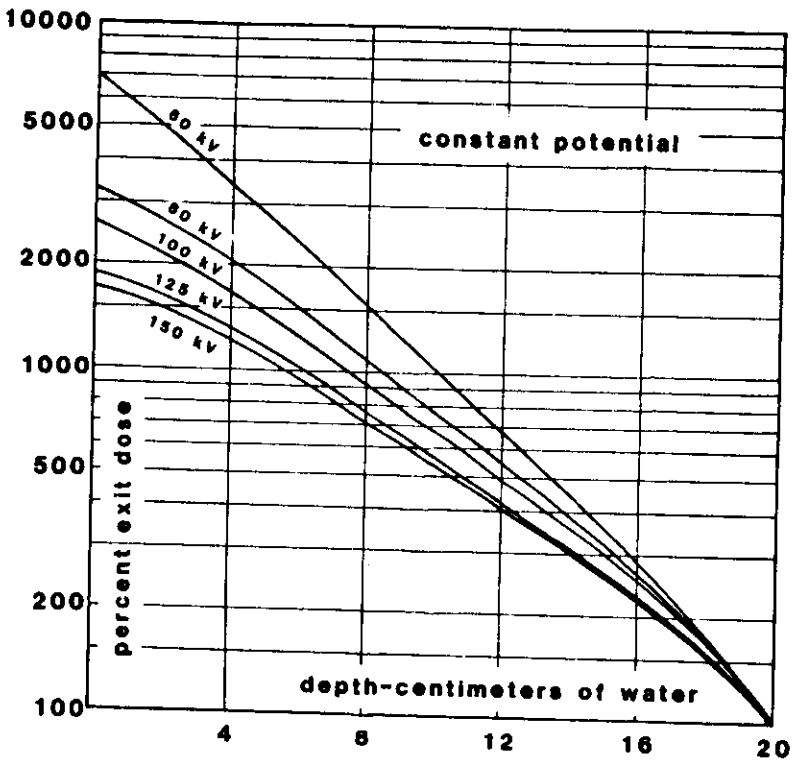

Fig. 1: Central axis depth dose in water normalised to exit dose.
Focus-to-film distance: 100 cm
Field size: 35 cm x 40 cm

2.2 Tube voltage

With the same restrictions as mentioned above, Figure 1 explains the dependance on tube voltage of entrance dose and depth dose values in a human body. Because of the increase in penetrating power of X-rays produced at higher tube voltages the entrance doses for the necessary dose at the image detecting system decrease. Therefore, intentional or incidental deviations of the selected tube voltage from a standard value can produce significant changes in organ doses.

2.3 Field size

For organs which are not visible in the X-ray image it is sometimes difficult or, if the edge of the radiation field is not visible, nearly impossible to decide whether they were in the radiation beam or not. For the same reason the estimation of the distance of an organ to the field edge can be uncertain. This holds in particular for fluoroscopic examinations where field size and movement of the fluoroscopic system are not recorded.

2.4 Antiscatter grids

The patient's exposure depends strongly upon the type of antiscatter grid used during the examination. The absorption of direct and scattered radiation in the grid is dependent upon tube voltage, field size and patient thickness. For two very common types of grids the grid factors (or prolongation factors) are shown in Figure 2 /6/. The grid factor describes how many times more radiation is necessary for an image performed with grid than without the grid. Moreover, misalignment and/or incorrect focus-to-grid distance can result in drastically higher grid factors and consequently in a higher entrance dose to the patient.

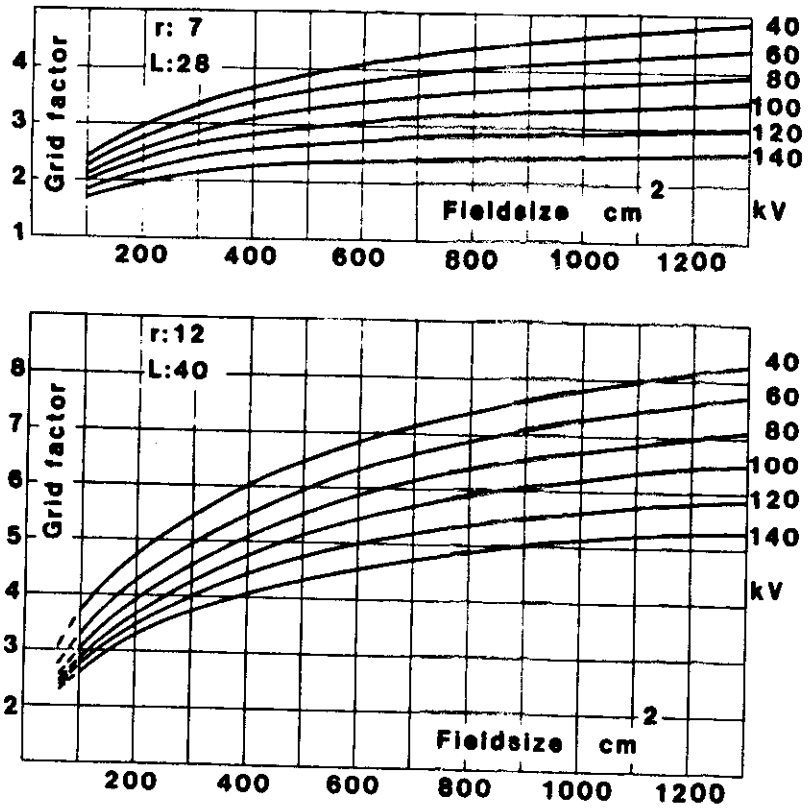

Fig. 2: Grid factor for two common grids.
Valid for 17 cm patient thickness
r: Grid ratio
L: Lines / cm

2.5 Sensitivity of image detecting systems

The large range of dose values necessary for the different systems and types of image detectors, as indicated in Table 1, leads to a considerable uncertainty in dose estimation for a particular examination even if the type of the image detector used is known. The reason is that the sensitivity of the same type of screens produced by different manufacturers differs rather widely, or that the automatic dose rate controls of image amplifier-TV-chains are adjusted to different values. Furthermore, there are variations due to film processing or to the mean optical density as individually preferred. An increase of the mean optical density from 0.8 to 1.2, which is considered to be the average range, corresponds to an increase of dose to the patient of about 50%.

Table 1: Sensitivity of Image Detector Systems (Approximate Values)

Image detector system	Absorbed dose in the image detector plane (µGy)
Non screen film	200 - 1000
Fluorography	30 - 80
Film-screen combinations:	
with high definition screens	7 - 30
with standard screens	3 - 8
with high speed screens	2 - 4
with rare-earth standard screens	0.25 - 1
Image intensifier:	
Fluorography	0.5 - 1
Cineradiography	0.1 - 0.5
Fluoroscopy	0.2 - 0.5 µGy/s

3. Conversion factors

Summing together the influences listed in sections 2.1 - 2.5 a large uncertainty results in the estimation of the organ doses of patients. Therefore the use of values from literature or other sources describing an individual case is uncertain. On the other hand it is very cumbersome, taking into account all the mentioned parameters, when attempting the determination of organ doses either by measurements in heterogeneous phantoms or by model calculations. The knowledge of conversion factors may facilitate this task especially when large, extended organs like lungs or bone marrow are considered. The conversion factors express organ doses in relation to an easily measurable quantity, e.g. the air absorbed dose in air on the axis of the radiation beam at the focus-to-skin-distance or in the case of CT-projections at the center of rotation. By this means the evaluation of organ doses follows the simple relationship:

$$D(\text{organ}) = C_f(\text{organ}) \times D(\text{air})$$

where C_f is the conversion factor listed in the tables.

D(air) can be measured or typical values can be taken from Figure 3 /1/. Similar data are published by the Hospital Physicists' Association /8/ and by Wachsmann and Drexler /6/. It should be kept in mind, however, that literature values cannot describe the respective situation exactly. In addition to the above mentioned parameters voltage ripple, anode angle, anode material and roughness of the anode surface may influence the output of X-ray tubes.

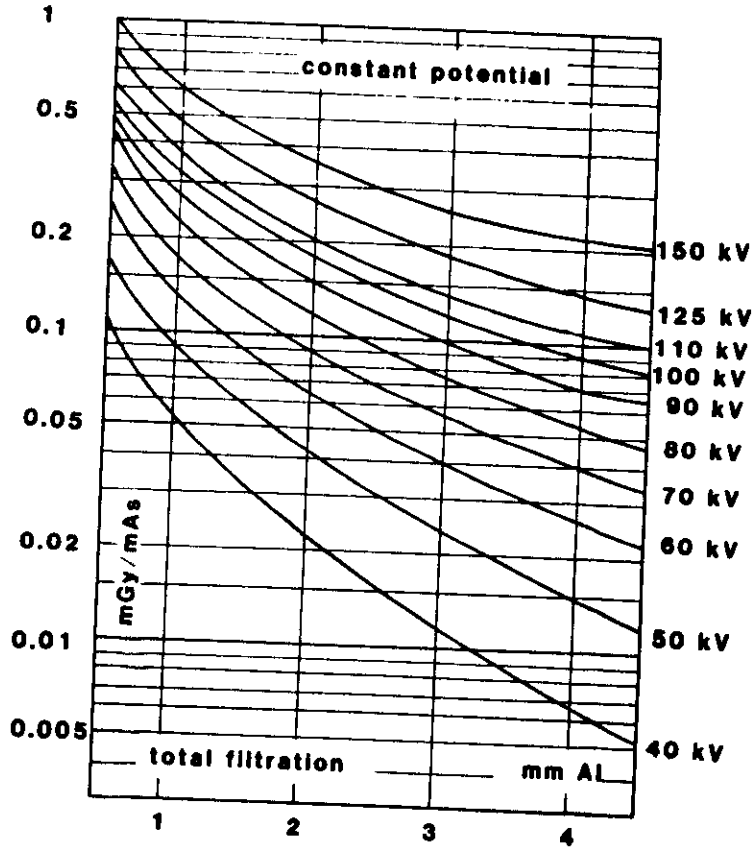

Fig. 3: Absorbed dose rate in air in 100 cm distance to focus. For single phase equipment the values have to be divided by 1.8

4. Exposure model

In the field of X-ray diagnosis conversion factors were first introduced by Rosenstein /7/. The main differences and improvements of the conversion factors presented in this work compared with /7/ are:

4.1 Male and female phantoms

The conversion factors are obtained by applying a Monte Carlo calculation method to modified MIRD-5 type mathematical male and female phantoms /9/.

With regard to weight, length, mass and composition of organs and tissues the design of the phantoms closely matches the data given in ICRP Publication 23 /10/ on reference man. The contours of the phantoms and the specified organs are described by mathematical formulae as spheres, ellipsoids, cylinders etc. and segments or combinations of such bodies (Figure 4).

The main improvements of the GSF ADAM and EVA sex specific phantoms are:

a) The female EVA phantom is representative of a reference female and possesses all female organs.
b) No female organs are present in the male phantom
c) The EVA phantom is significantly smaller than the ADAM phantom.
d) The arms for both GSF phantoms are removable.
e) The phantoms possess a chin so that less tissue exists in front of the thyroid.
f) The skull of ADAM and EVA is improved with regard to shape and size.

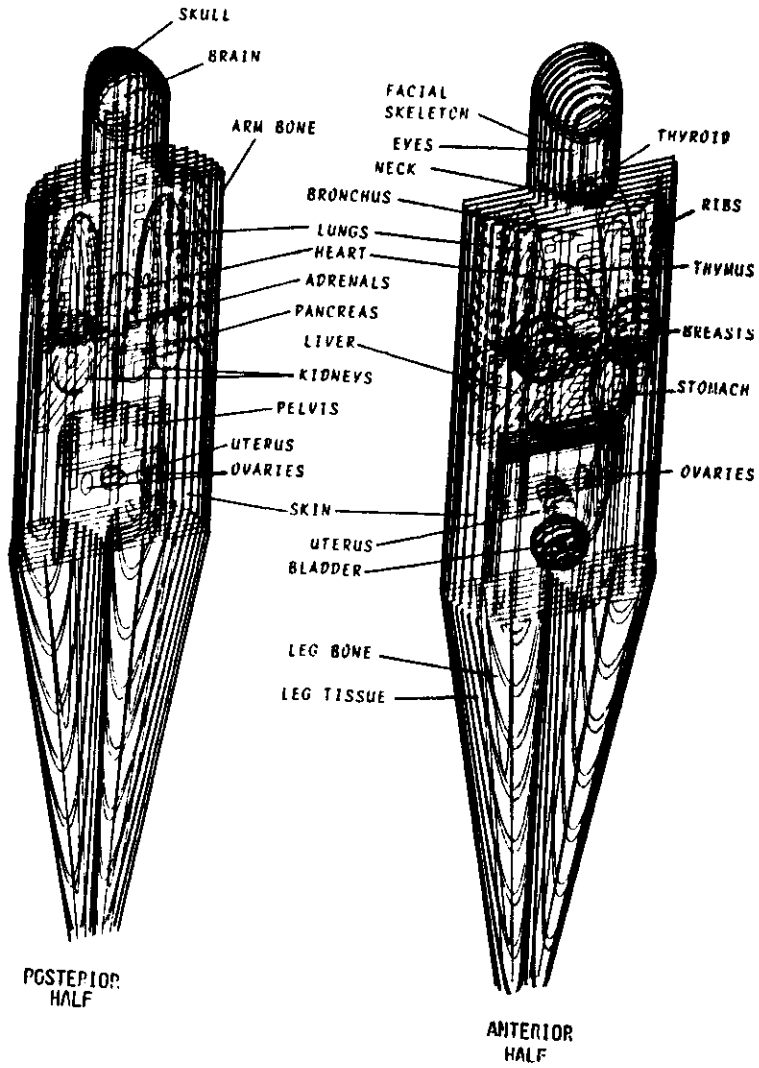

Fig. 4: Perspective superpositions of vertical planes through the female phantom

The ADAM and EVA phantoms were exposed in the same way, as that used by Rosenstein for the pediatric studies. The tissue-air-ratio-function method used by Rosenstein for the adult studies was not employed in this report. Also for lateral projections the arms of the phantoms were removed. In addition the spectral energy range covered in this report is from 10 keV to 140 keV, whereas Rosenstein gives spectra in the energy range 20 keV to 100 keV.

4.2 Physical exposure conditions

With this exposure model the three dimensional scattering of 2×10^6 incident photons was simulated under observation of the following physical conditions of irradiation:

- Radiation quality, given by the spectral distribution of the incoming radiation determined by tube voltage and filtration
- Field size in the image receptor plane
- Focus to skin distance
- Direction of incidence.

4.3 Selection of exposure parameters

Great care was taken in the selection of the above mentioned physical and irradiation parameters, for the examinations dealt with in this publication, to be very similar to routine conditions as common in Europe.

However, these attempts are limited because of the restrictions associated with the exposure model:

- Only projections with the beam axis vertical to the length axis of the phantoms have not been simulated in this study.

- The phantoms are rigid and cannot imitate special positions which are typical for a number of X-ray examinations. Nevertheless, for the lateral examinations of thorax and spine the arms of the phantoms were removed.

5. Accuracy of modelling

In the last column of the tables the statistical error of the conversion factors is quoted. This error is introduced by the Monte Carlo calculation and depends upon the probability and the magnitude of energy of absorption events in the respective organ. Large organs within the beam are characterized by small errors, while small organs outside the beam show higher statistical errors. These statistical errors may sometimes mask trends expected due to the variation of irradiation parameters or indicate differences which do not occur in reality.

6. Interpretation of the Tables

Given at the top of each table are the radiation qualities, field sizes and radiographic projections studied, including source-to-skin and source-to-film distances.

The tables quote the organ doses normalised to unit entrance air absorbed dose, D(Air), free in air (see Figure 3). The tabulated values are referred to as conversion factors from which the organ doses are obtained by multiplication with the air absorbed dose for the particular technique.

The entrance air dose in free air is defined as the air absorbed dose on the axis of the radiation beam at the point of intersection with the body (or skin) in the absence of the body.

In addition, skin doses at the entrance or the exit of the beam are given at the bottom of each column to indicate how the ratios of entrance to exit surface doses vary with radiation qualities and projections (see Figure 1 for comparison).

One possible misinterpretation of the conversion factors, however, must be avoided, namely that higher tube voltages give rise to higher organ doses: At higher tube voltages the entrance dose, to provide a sufficient signal to the image detector, drops significantly more (Figure 1) than the increase in the conversion factors, resulting in the expected reduction in organ doses.

In the case of CT projections the normalising quantity is the air absorbed dose in free air measured at a point defined by the intersection of the radiation beam axis and the rotational axis of the CT scanner.

The organ dose conversion factors for CT examinations give the mean organ doses for 15, 20 or 25 consecutive scan slices for pelvis, liver, lung and head scans.

7. Variation of patient size

The conversion factors listed in the tables hold strictly only for patients of the same size as the phantoms. In a crude approximation, however, they can also be used together with adult patients of diverse thicknesses when they are related to the actual air absorbed dose necessary to give the required dose at the image detector. By this rule of thumb procedure the maximum error occurs when small organs within the useful beam and close to the exit surface are considered. This error can be roughly estimated from Figure 1. For other organs the error should decrease and should finally disappear for small organs near the entrance surface.

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on the physical exposure conditions normally met in radiological practice and the compilation of the respective exposure conditions table used.

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REFERENCES

/1/ Protection of the Patient in Diagnostic Radiology. ICRP Publication 34, Pergamon Press, Oxford, New York, Frankfurt (1982)

/2/ Betz, B., Niklas, K., Stieve, F.E. (Herausg.): Schwangerschaftsabbruch nach Strahlenexposition durch medizinische Maßnahmen. GSF-Bericht K-84 (1977)

/3/ Recommendations of the International Commission on Radiological Protection. ICRP Publication 26, Pergamon Press, Oxford, New York, Frankfurt (1977)

/4/ Jacobi, W.: The Concept of Effective Dose - A Proposal for the Combination of Organ Doses. Radiat. Environ. Biophysics, 12, 101 (1975)

/5/ Kelley, Z.P., Trout, E.D.: Physical Characteristics of the Radiation from 2-Pulse, 12-Pulse and 1,000-Pulse X-Ray Equipment. Radiology 100, 653-661 (1977)

/6/ Wachsmann, F., Drexler, G.: Graphs and Tables for Use in Radiology. Springer-Verlag, Berlin, Heidelberg, New York (1976)

/7/ Rosenstein, M.: Organdoses in Diagnostic Radiology. HEW-Publication (FDA) 76-8030 Bureau of Radiological Health, Rockville, MD 20842 (1976)

/8/ The Physics of Radiodiagnosis. The Hospital Physicists' Association, London (1977)

/9/ Kramer, R., Zankl, M., Williams, G., Drexler, G.: The Calculation of Dose from External Photon Exposures Using Reference Human Phantoms and Monte Carlo Methods. Part I: The Male (Adam) and Female (Eva) Adult Mathematical Phantoms. GSF-Bericht S-885 (1982)

/10/ Report of the Task Group on Reference Man. ICRP Publication 23, Pergamon Press, Oxford, New York, Frankfurt (1975)

Table 1: LUNGS p.a.

Field size ♀ 35 cm x 35 cm
Field size ♂ 35 cm x 40 cm
Patient thickness ♀ 19 cm
Patient thickness ♂ 20 cm
Focus-to-film distance 150 cm
Focus-to-skin distance 120 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		90 kV		125 kV		[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.02	0.02	0.06	0.06	0.09	0.09	4.0
Breast	-	0.06	-	0.13	-	0.19	0.6
Lungs	0.34	0.37	0.52	0.55	0.66	0.69	0.2
Spleen	0.13	0.09	0.21	0.15	0.27	0.20	0.9
Pancreas	0.07	0.04	0.14	0.09	0.21	0.14	1.3
Stomach Wall	0.03	0.03	0.06	0.06	0.09	0.09	1.5
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	0.01	0.01	4.0
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.06	0.06	0.10	0.11	0.14	0.16	0.1
Skeleton	0.20	0.22	0.27	0.30	0.32	0.35	0.1
Surface (entr.)	1.12	1.13	1.25	1.22	1.31	1.32	1.0
Surface (exit)	0.01	0.02	0.04	0.04	0.07	0.08	4.5

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 2: LUNGS p.a.

Field size ♀	35 cm x 35 cm	Focus-to-film distance	180 cm
Field size ♂	35 cm x 40 cm	Focus-to-skin distance	150 cm
Patient thickness ♀	19 cm	Total filtration	2.5 mm Al
Patient thickness ♂	20 cm		

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		125 kV		140 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.06	0.06	0.10	0.10	0.12	0.12	3.5
Breast	-	0.13	-	0.19	-	0.22	0.6
Lungs	0.54	0.57	0.68	0.72	0.73	0.76	0.2
Spleen	0.25	0.18	0.33	0.24	0.35	0.26	0.9
Pancreas	0.17	0.12	0.25	0.17	0.27	0.19	1.2
Stomach Wall	0.07	0.06	0.11	0.10	0.12	0.11	1.3
Small Intestine	**	**	**	**	0.01	0.01	2.0
Colon (Upper)[c]	**	**	0.01	0.01	0.01	0.01	3.5
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.11	0.12	0.16	0.17	0.17	0.18	0.1
Skeleton	0.30	0.32	0.35	0.38	0.36	0.39	0.1
Surface (entr.)	1.24	1.24	1.27	1.32	1.35	1.34	0.1
Surface (exit)	0.04	0.05	0.07	0.08	0.09	0.10	4.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 3: LUNGS a.p.

Field size ♀	35 cm x 35 cm	Focus-to-film distance	115 cm
Field size ♂	35 cm x 40 cm	Focus-to-skin distance	85 cm
Patient thickness ♀	19 cm	Total filtration	2.5 mm Al
Patient thickness ♂	20 cm		

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		90 kV		125 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.09	0.06	0.16	0.11	0.21	0.15	2.3
Breast	-	0.86	-	1.03	-	1.15	0.2
Lungs	0.31	0.23	0.46	0.37	0.58	0.49	0.2
Spleen	0.04	0.03	0.07	0.06	0.11	0.08	1.3
Pancreas	0.06	0.03	0.12	0.07	0.17	0.11	1.3
Stomach Wall	0.09	0.05	0.13	0.09	0.18	0.12	1.0
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	0.01	0.01	4.0
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.03	0.05	0.05	0.07	0.07	0.2
Skeleton	0.12	0.11	0.16	0.16	0.18	0.18	0.1
Surface (entr.)	1.15	1.18	1.25	1.30	1.34	1.40	1.0
Surface (exit)	0.01	0.01	0.03	0.04	0.05	0.06	5.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 4: RIBS a.p.

Field size ♀	17 cm x 40 cm	Focus-to-film distance	115 cm
Field size ♂	18 cm x 40 cm	Focus-to-skin distance	85 cm
Patient thickness ♀	19 cm	Total filtration	2.5 mm Al
Patient thickness ♂	20 cm		

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.02	0.03	0.02	0.03	0.03	0.04	3.1
Breast	-	0.46	-	0.49	-	0.52	0.2
Lungs	0.17	0.13	0.20	0.15	0.23	0.18	0.2
Spleen	0.04	0.05	0.06	0.07	0.07	0.08	0.9
Pancreas	0.04	0.06	0.05	0.08	0.07	0.09	1.1
Stomach Wall	0.09	0.11	0.10	0.13	0.12	0.15	0.6
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.02	0.02	0.02	0.02	0.1
Skeleton	0.07	0.07	0.08	0.07	0.09	0.08	0.1
Surface (entr.)	1.16	1.13	1.19	1.18	1.22	1.21	0.6
Surface (exit)	0.05	0.04	0.07	0.06	0.09	0.07	2.4

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 5: LUNGS left lat.

Field size ♀	25 cm x 35 cm	Focus-to-film distance	150 cm
Field size ♂	25 cm x 40 cm	Focus-to-skin distance	100 cm
Patient thickness ♀	33 cm	Total filtration	2.5 mm Al
Patient thickness ♂	35 cm		

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		125 kV		140 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.02	0.02	0.04	0.04	0.05	0.05	3.5
Breast	-	0.13	-	0.17	-	0.18	0.4
Lungs	0.24	0.25	0.32	0.33	0.34	0.35	0.2
Spleen	0.08	0.05	0.12	0.07	0.13	0.08	1.0
Pancreas	0.05	0.04	0.08	0.06	0.08	0.07	1.3
Stomach Wall	0.06	0.04	0.08	0.06	0.09	0.07	1.0
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.04	0.04	0.06	0.06	0.07	0.07	0.2
Skeleton	0.13	0.13	0.16	0.16	0.16	0.17	0.1
Surface (entr.)	1.24	1.25	1.28	1.30	1.33	1.32	1.0
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.02	6.5

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 6: LUNGS right lat.

Field size ♀ 25 cm x 35 cm
Field size ♂ 25 cm x 40 cm
Patient thickness ♀ 33 cm
Patient thickness ♂ 35 cm

Focus-to-film distance 150 cm
Focus-to-skin distance 100 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		125 kV		140 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.02	0.03	0.04	0.04	0.05	0.04	3.5
Breast	-	0.14	-	0.17	-	0.18	0.4
Lungs	0.24	0.25	0.32	0.33	0.34	0.35	0.2
Spleen	**	**	0.01	0.01	0.02	0.02	2.5
Pancreas	0.02	0.02	0.03	0.03	0.04	0.04	2.0
Stomach Wall	0.01	0.01	0.02	0.02	0.02	0.02	2.0
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.04	0.04	0.06	0.06	0.07	0.07	0.2
Skeleton	0.13	0.13	0.16	0.16	0.16	0.17	0.2
Surface (entr.)	1.23	1.24	1.30	1.29	1.33	1.33	1.0
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.02	7.0

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 7: SHOULDER JOINT a.p.

Field size 18 cm x 20 cm
Patient thickness ♀ 11 cm
Patient thickness ♂ 12 cm

Focus-to-film distance 150 cm
Focus-to-skin distance 130 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		kV		%[b]
Organ	♂	♀	♂	♀			
Brain	**	**	**	**			-
Eyelenses	**	**	**	**			-
Thyroid	**	**	**	0.01			4.3
Breast	-	0.08	-	0.08			0.4
Lungs	0.09	0.08	0.11	0.10			0.3
Spleen	**	**	**	**			-
Pancreas	**	**	**	**			-
Stomach Wall	**	**	**	**			-
Small Intestine	**	**	**	**			-
Colon (Upper)[c]	**	**	**	**			-
Colon (Lower)[d]	**	**	**	**			-
Ovaries	-	**	-	**			-
Uterus	-	**	-	**			-
Testes	**	-	**	-			-
Red Bone Marrow	0.01	0.01	0.01	0.01			0.2
Skeleton	0.06	0.06	0.07	0.07			0.1
Surface (entr.)	1.42	1.31	1.44	1.33			0.5
Surface (exit)	0.03	0.04	0.05	0.05			2.3

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 8: SKULL p.a.

Field size ♀	16 cm x 23 cm	Focus-to-film distance	150 cm
Field size ♂	18 cm x 25 cm	Focus-to-skin distance	120 cm
Patient thickness ♀	19 cm	Total filtration	2.5 mm Al
Patient thickness ♂	20 cm		

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.15	0.17	0.18	0.20	0.22	0.24	0.2
Eyelenses	0.01	0.01	0.01	0.01	0.02	0.02	7.0
Thyroid	0.04	0.02	0.05	0.03	0.06	0.04	2.5
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.03	0.03	0.03	0.04	0.04	0.1
Skeleton	0.09	0.09	0.10	0.10	0.11	0.11	0.1
Surface (entr.)	1.15	1.14	1.20	1.16	1.22	1.18	0.5
Surface (exit)	0.01	0.01	0.01	0.01	0.01	0.02	5.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 9: SKULL a.p.

Field size ♀	16 cm x 23 cm	Focus-to-film distance	150 cm
Field size ♂	18 cm x 25 cm	Focus-to-skin distance	120 cm
Patient thickness ♀	19 cm	Total filtration	2.5 mm Al
Patient thickness ♂	20 cm		

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.14	0.16	0.18	0.19	0.21	0.23	0.2
Eyelenses	1.10	1.11	1.13	1.15	1.18	1.18	1.0
Thyroid	0.71	0.12	0.76	0.14	0.81	0.16	1.0
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.03	0.03	0.03	0.03	0.1
Skeleton	0.11	0.12	0.12	0.14	0.14	0.15	0.1
Surface (entr.)	1.05	1.12	1.08	1.15	1.09	1.18	0.6
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.02	4.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 10: SKULL lat.

Field size 24 cm x 30 cm
Patient thickness ♀ 15 cm
Patient thickness ♂ 16 cm
Focus-to-film distance 150 cm
Focus-to-skin distance 124 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.17	0.19	0.22	0.24	0.26	0.29	0.3
Eyelenses	0.48	0.51	0.51	0.51	0.54	0.56	1.8
Thyroid	0.30	0.32	0.35	0.36	0.40	0.41	1.2
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.03	0.03	0.04	0.04	0.04	0.2
Skeleton	0.12	0.13	0.13	0.15	0.15	0.16	0.1
Surface (entr.)	1.14	1.11	1.17	1.14	1.20	1.19	0.7
Surface (exit)	0.01	0.02	0.02	0.02	0.03	0.03	4.0

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 11: SKULL p.a.

Field size ♀ 22 cm x 28 cm
Field size ♂ 24 cm x 30 cm
Patient thickness ♀ 19 cm
Patient thickness ♂ 20 cm
Focus-to-film distance 115 cm
Focus-to-skin distance 85 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.15	0.17	0.19	0.20	0.22	0.24	0.3
Eyelenses	0.01	0.01	0.01	0.01	0.02	0.02	9.0
Thyroid	0.04	0.03	0.05	0.04	0.06	0.06	2.5
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.03	0.03	0.03	0.04	0.04	0.2
Skeleton	0.09	0.09	0.10	0.10	0.11	0.11	0.1
Surface (entr.)	1.16	1.12	1.17	1.16	1.22	1.19	0.6
Surface (exit)	0.01	0.01	0.01	0.01	0.01	0.02	5.5

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 12: SKULL a.p.

Field size ♀ 22 cm x 28 cm — Focus-to-film distance 115 cm

Field size ♂ 24 cm x 30 cm — Focus-to-skin distance 85 cm

Patient thickness ♀ 19 cm — Total filtration 2.5 mm Al

Patient thickness ♂ 20 cm

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.14	0.16	0.18	0.19	0.21	0.23	0.3
Eyelenses	1.10	1.12	1.13	1.14	1.15	1.15	1.1
Thyroid	0.77	0.34	0.85	0.37	0.87	0.41	1.0
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.03	0.03	0.03	0.03	0.2
Skeleton	0.11	0.12	0.13	0.13	0.14	0.15	1.0
Surface (entr.)	1.06	1.14	1.08	1.18	1.10	1.18	0.7
Surface (exit)	0.01	0.01	0.01	0.01	0.02	0.02	5.0

a If using old units: 1 mSv/mGy = 0.869 rem/R

b Percentage Mean Error

c Caecum + Ascending + Transverse

d Descending + Sigmoid + Rectum

** Less than 0.01 mSv/mGy

Table 13: SKULL lat.

Field size 24 cm x 30 cm — Focus-to-film distance 115 cm

Patient thickness ♀ 15 cm — Focus-to-skin distance 90 cm

Patient thickness ♂ 16 cm — Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.16	0.18	0.20	0.23	0.25	0.27	0.3
Eyelenses	0.46	0.47	0.48	0.50	0.50	0.53	1.8
Thyroid	0.28	0.27	0.32	0.32	0.38	0.36	1.2
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.03	0.03	0.03	0.04	0.04	0.2
Skeleton	0.11	0.12	0.13	0.14	0.15	0.16	0.1
Surface (entr.)	1.14	1.11	1.17	1.13	1.19	1.17	0.7
Surface (exit)	0.01	0.01	0.02	0.02	0.03	0.03	4.0

a If using old units: 1 mSv/mGy = 0.869 rem/R

b Percentage Mean Error

c Caecum + Ascending + Transverse

d Descending + Sigmoid + Rectum

** Less than 0.01 mSv/mGy

Table 14: SINUSES p.a.

Field size	18 cm x 20 cm	Focus-to-film distance	150 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	120 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.09	0.13	0.11	0.16	0.14	0.20	0.2
Eyelenses	**	**	0.01	0.01	0.01	0.02	8.0
Thyroid	0.02	0.02	0.03	0.02	0.04	0.03	2.7
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.02	0.03	0.02	0.03	0.1
Skeleton	0.05	0.07	0.07	0.08	0.08	0.10	0.1
Surface (entr.)	1.13	1.11	1.16	1.13	1.18	1.17	0.5
Surface (exit)	**	**	0.01	0.01	0.01	0.01	5.5

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 15: CERVICAL SPINE a.p.

Field size	12 cm x 20 cm	Focus-to-film distance	150 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	125 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.02	0.03	0.03	0.04	0.04	0.06	0.4
Eyelenses	0.97	1.06	1.00	1.08	1.03	1.11	0.7
Thyroid	0.78	0.82	0.83	0.89	0.89	0.96	0.5
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	**	0.01	0.01	0.01	0.01	0.01	0.1
Skeleton	0.05	0.06	0.06	0.08	0.07	0.09	0.1
Surface (entr.)	1.06	1.09	1.08	1.12	1.11	1.14	0.5
Surface (exit)	0.01	0.01	0.01	0.01	0.01	0.02	4.1

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 16: CERVICAL SPINE a.p.

Field size 12 cm x 24 cm
Patient thickness ♀ 19 cm
Patient thickness ♂ 20 cm
Focus-to-film distance 115 cm
Focus-to-skin distance 90 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.03	0.05	0.05	0.06	0.06	0.08	0.3
Eyelenses	1.03	1.05	1.08	1.09	1.10	1.11	0.7
Thyroid	0.75	0.80	0.81	0.87	0.87	0.93	0.5
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.01	0.01	0.01	0.01	0.01	0.02	0.1
Skeleton	0.06	0.07	0.06	0.08	0.07	0.09	1.0
Surface (entr.)	1.06	1.09	1.09	1.12	1.10	1.15	0.5
Surface (exit)	0.01	0.01	0.01	0.01	0.01	0.01	4.4

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 17: CERVICAL SPINE lat.

Field size 14 cm x 24 cm
Patient thickness ♀ 15 cm
Patient thickness ♂ 16 cm
Focus-to-film distance 150 cm
Focus-to-skin distance 110 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.03	0.04	0.03	0.05	0.04	0.06	0.3
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.01	0.01	0.01	0.02	0.02	0.02	2.7
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.01	0.01	0.01	0.01	0.01	0.02	0.1
Skeleton	0.03	0.03	0.04	0.04	0.04	0.05	0.1
Surface (entr.)	1.05	1.08	1.08	1.12	1.10	1.13	0.4
Surface (exit)	0.11	0.13	0.13	0.15	0.15	0.17	1.1

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 18: CERVICAL SPINE lat.

Field size 14 cm x 24 cm
Patient thickness ♀ 15 cm
Patient thickness ♂ 16 cm
Focus-to-film distance 115 cm
Focus-to-skin distance 75 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.02	0.02	0.02	0.03	0.03	0.04	0.4
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.01	0.01	0.01	0.01	0.01	0.02	2.7
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	**	**	0.01	0.01	0.01	0.01	0.1
Skeleton	0.02	0.03	0.03	0.03	0.03	0.04	0.1
Surface (entr.)	1.02	1.07	1.05	1.09	1.09	1.12	0.4
Surface (exit)	0.10	0.12	0.12	0.14	0.14	0.16	1.1

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 19: THORACIC SPINE a.p.

Field size 12 cm x 40 cm
Patient thickness ♀ 19 cm
Patient thickness ♂ 20 cm
Focus-to-film distance 115 cm
Focus-to-skin distance 85 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.05	0.33	0.06	0.36	0.06	0.39	3.0
Breast	-	0.09	-	0.10	-	0.11	0.5
Lungs	0.04	0.05	0.05	0.06	0.06	0.07	0.4
Spleen	**	**	0.01	0.01	0.01	0.01	2.0
Pancreas	0.05	0.05	0.06	0.06	0.07	0.08	1.0
Stomach Wall	0.02	0.02	0.02	0.02	0.03	0.03	1.5
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.01	0.01	0.02	0.02	0.02	0.02	0.2
Skeleton	0.05	0.05	0.05	0.06	0.05	0.06	0.2
Surface (entr.)	1.14	1.18	1.16	1.21	1.19	1.24	0.5
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.02	6.0

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 20: THORACIC SPINE lat.

Field size	15 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness ♀	33 cm	Focus-to-skin distance	70 cm
Patient thickness ♂	35 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	0.07	0.08	0.09	0.09	0.10	0.11	0.2
Spleen	0.04	0.04	0.05	0.04	0.06	0.05	0.8
Pancreas	0.01	0.01	0.02	0.02	0.02	0.02	1.5
Stomach Wall	**	**	0.01	0.01	0.01	0.01	1.6
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.02	0.03	0.03	0.03	0.1
Skeleton	0.06	0.08	0.07	0.09	0.08	0.09	0.1
Surface (entr.)	0.80	0.83	0.82	0.85	0.84	0.88	0.4
Surface (exit)	0.02	0.02	0.02	0.03	0.02	0.03	2.2

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 21: LUMBAR SPINE + SACRUM a.p.

Field size	15 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.01	0.01	0.01	0.02	0.02	0.02	2.0
Pancreas	0.05	0.09	0.06	0.11	0.07	0.14	1.5
Stomach Wall	0.07	0.11	0.08	0.13	0.09	0.14	1.0
Small Intestine	0.18	0.21	0.21	0.25	0.24	0.28	0.5
Colon (Upper)[c]	0.14	0.17	0.17	0.20	0.19	0.23	0.5
Colon (Lower)[d]	0.05	0.06	0.06	0.07	0.07	0.08	1.0
Ovaries	-	0.17	-	0.21	-	0.24	1.5
Uterus	-	0.28	-	0.33	-	0.38	0.5
Testes	0.01	-	0.02	-	0.02	-	3.0
Red Bone Marrow	0.01	0.01	0.01	0.02	0.02	0.02	0.5
Skeleton	0.01	0.02	0.01	0.02	0.02	0.03	0.5
Surface (entr.)	1.22	1.22	1.25	1.24	1.27	1.28	1.0
Surface (exit)	0.01	0.01	0.02	0.02	0.02	0.03	5.0

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 22: LUMBAR SPINE + SACRUM lat.
(Uterus partially in beam)

Field size	20 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness ♀	33 cm	Focus-to-skin distance	70 cm
Patient thickness ♂	35 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		100 kV		110 kV		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.07	0.16	0.08	0.17	0.08	0.18	0.7
Pancreas	0.02	0.04	0.02	0.04	0.02	0.05	1.5
Stomach Wall	0.02	0.03	0.03	0.04	0.03	0.04	1.1
Small Intestine	0.06	0.07	0.06	0.07	0.07	0.08	0.4
Colon (Upper)[c]	0.03	0.04	0.03	0.04	0.04	0.04	0.9
Colon (Lower)[d]	0.08	0.09	0.09	0.09	0.10	0.10	0.7
Ovaries	-	0.08	-	0.08	-	0.09	2.5
Uterus	-	0.04	-	0.04	-	0.05	1.4
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.04	0.04	0.04	0.04	0.05	0.2
Skeleton	0.03	0.04	0.03	0.04	0.04	0.05	0.2
Surface (entr.)	0.90	0.93	0.91	0.94	0.92	0.95	0.4
Surface (exit)	0.03	0.03	0.03	0.04	0.03	0.04	2.3

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 22a: LUMBAR SPINE + SACRUM lat. (♀ only)
(Uterus completely in beam)

Field size	30 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness	33 cm	Focus-to-skin distance	70 cm
		Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		100 kV		110 kV		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain		**		**		**	-
Eyelenses		**		**		**	-
Thyroid		**		**		**	-
Breast	-	**	-	**	-	**	-
Lungs		**		**		**	-
Spleen		0.18		0.19		0.20	0.7
Pancreas		0.06		0.06		0.07	1.3
Stomach Wall		0.19		0.20		0.21	0.6
Small Intestine		0.13		0.14		0.16	0.3
Colon (Upper)[c]		0.09		0.09		0.10	0.7
Colon (Lower)[d]		0.20		0.21		0.23	0.6
Ovaries	-	0.11	-	0.12	-	0.13	2.4
Uterus	-	0.08	-	0.08	-	0.09	1.2
Testes		-		-		-	
Red Bone Marrow		0.04		0.05		0.05	0.3
Skeleton		0.05		0.05		0.05	0.2
Surface (entr.)		1.27		1.29		1.30	0.7
Surface (exit)		**		**		0.01	10.6

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 23: LUMBAR SPINE + SACRUM lat.

Field size	20 cm x 40 cm	Focus-to-film distance	150 cm
Patient thickness ♀	33 cm	Focus-to-skin distance	110 cm
Patient thickness ♂	35 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		100 kV		110 kV		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.18	0.31	0.19	0.31	0.20	0.34	0.6
Pancreas	0.04	0.10	0.05	0.11	0.05	0.12	1.3
Stomach Wall	0.05	0.07	0.05	0.07	0.06	0.08	1.0
Small Intestine	0.08	0.09	0.08	0.09	0.09	0.10	0.4
Colon (Upper)[c]	0.04	0.05	0.05	0.05	0.05	0.06	0.9
Colon (Lower)[d]	0.14	0.15	0.15	0.16	0.16	0.17	0.6
Ovaries	-	0.09	-	0.10	-	0.11	2.7
Uterus	-	0.05	-	0.06	-	0.07	1.5
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.04	0.05	0.05	0.05	0.05	0.06	0.2
Skeleton	0.05	0.06	0.05	0.06	0.05	0.07	0.2
Surface (entr.)	0.95	0.99	0.97	0.99	0.99	1.01	0.5
Surface (exit)	0.03	0.04	0.04	0.05	0.04	0.05	2.4

[a] If using old units: 1 mSv/mGy = 0.869 rem/R

[b] Percentage Mean Error

[c] Caecum + Ascending + Transverse

[d] Descending + Sigmoid + Rectum

** Less than 0.01 mSv/mGy

Table 24: SACRUM a.p.

Field size	24 cm x 24 cm	Focus-to-film distance	115 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	0.11	0.16	0.14	0.19	0.16	0.22	0.5
Colon (Upper)[c]	0.08	0.12	0.10	0.14	0.11	0.16	0.7
Colon (Lower)[d]	0.15	0.19	0.18	0.22	0.20	0.26	0.5
Ovaries	-	0.22	-	0.26	-	0.31	1.5
Uterus	-	0.30	-	0.35	-	0.41	0.5
Testes	0.04	-	0.05	-	0.05	-	2.0
Red Bone Marrow	0.01	0.02	0.02	0.02	0.02	0.03	0.3
Skeleton	0.01	0.02	0.02	0.02	0.02	0.03	0.3
Surface (entr.)	1.23	1.23	1.27	1.25	1.31	1.30	1.0
Surface (exit)	0.02	0.02	0.02	0.03	0.03	0.04	4.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 25: SACRUM lat.

Field size	20 cm x 30 cm	Focus-to-film distance	115 cm
Patient thickness ♀	33 cm	Focus-to-skin distance	70 cm
Patient thickness ♂	35 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		100 kV		110 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	0.02	0.04	0.03	0.04	0.03	0.04	0.5
Colon (Upper)[c]	**	0.01	**	0.01	0.01	0.01	1.4
Colon (Lower)[d]	0.09	0.11	0.10	0.12	0.11	0.13	0.5
Ovaries	-	0.08	-	0.08	-	0.09	2.2
Uterus	-	0.04	-	0.04	-	0.05	1.2
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.03	0.04	0.03	0.04	0.04	0.05	0.2
Skeleton	0.03	0.04	0.03	0.04	0.04	0.04	0.2
Surface (entr.)	0.86	0.94	0.90	0.93	0.92	0.96	0.4
Surface (exit)	0.03	0.04	0.03	0.04	0.03	0.04	2.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 26: SACRUM lat.

Field size 20 cm x 30 cm
Patient thickness ♀ 33 cm
Patient thickness ♂ 35 cm
Focus-to-film distance 150 cm
Focus-to-skin distance 110 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		100 kV		110 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	0.04	0.06	0.05	0.06	0.05	0.07	0.5
Colon (Upper)[c]	0.01	0.02	0.01	0.02	0.02	0.03	1.3
Colon (Lower)[d]	0.14	0.16	0.15	0.17	0.17	0.19	0.5
Ovaries	-	0.09	-	0.10	-	0.11	2.3
Uterus	-	0.05	-	0.06	-	0.07	1.3
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.04	0.05	0.05	0.05	0.05	0.06	0.2
Skeleton	0.05	0.05	0.05	0.06	0.05	0.06	0.2
Surface (entr.)	0.95	0.99	0.96	0.98	0.98	1.00	0.4
Surface (exit)	0.04	0.05	0.04	0.05	0.04	0.05	2.0

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 27: PELVIS a.p.

Field size ♀ 38 cm x 30 cm
Field size ♂ 40 cm x 30 cm
Patient thickness ♀ 19 cm
Patient thickness ♂ 20 cm
Focus-to-film distance 115 cm
Focus-to-skin distance 85 cm
Total filtration 2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.01	0.01	0.01	0.02	0.01	0.02	3.0
Pancreas	0.01	0.01	0.01	0.02	0.02	0.02	4.0
Stomach Wall	0.03	0.06	0.03	0.08	0.04	0.09	2.0
Small Intestine	0.28	0.33	0.34	0.38	0.39	0.44	0.5
Colon (Upper)[c]	0.34	0.38	0.39	0.45	0.45	0.50	0.5
Colon (Lower)[d]	0.26	0.29	0.32	0.35	0.36	0.40	0.7
Ovaries	-	0.26	-	0.31	-	0.37	2.0
Uterus	-	0.33	-	0.40	-	0.45	1.0
Testes	0.16	-	0.18	-	0.19	-	2.0
Red Bone Marrow	0.04	0.04	0.05	0.05	0.06	0.07	0.3
Skeleton	0.07	0.08	0.09	0.10	0.10	0.11	0.2
Surface (entr.)	1.25	1.26	1.27	1.29	1.31	1.32	1.0
Surface (exit)	0.02	0.02	0.03	0.03	0.03	0.04	6.0

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 28: RIGHT HIP JOINT a.p.

Field size	18 cm x 24 cm	Focus-to-film distance	115 cm
Patient thickness ♀	15 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	16 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	70 kV		80 kV		90 kV		ε^b
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	0.01	0.01	0.01	0.01	0.02	0.7
Colon (Upper)[c]	0.02	0.03	0.02	0.03	0.03	0.04	0.8
Colon (Lower)[d]	**	**	0.01	0.01	0.01	0.01	1.3
Ovaries	-	0.08	-	0.09	-	0.10	2.0
Uterus	-	0.03	-	0.04	-	0.05	1.1
Testes	0.04	-	0.05	-	0.05	-	1.4
Red Bone Marrow	0.01	0.01	0.01	0.02	0.02	0.02	0.3
Skeleton	0.02	0.02	0.02	0.03	0.03	0.03	0.2
Surface (entr.)	1.21	1.22	1.24	1.26	1.26	1.28	0.5
Surface (exit)	0.02	0.03	0.03	0.04	0.04	0.05	2.5

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 29: LEFT FEMUR a.p.

Field size	15 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness ♀	15 cm	Focus-to-skin distance	90 cm
Patient thickness ♂	16 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		ε^b
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	0.02	-	0.03	-	0.03	-	2.2
Red Bone Marrow	**	**	**	**	**	**	-
Skeleton	0.04	0.04	0.05	0.06	0.07	0.07	0.2
Surface (entr.)	1.16	1.11	1.20	1.13	1.20	1.19	0.6
Surface (exit)	0.02	0.04	0.03	0.05	0.04	0.06	2.8

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 30: ABDOMEN a.p.

Field size	30 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	0.01	2.0
Lungs	**	**	**	0.01	**	0.02	1.5
Spleen	0.05	0.08	0.07	0.10	0.09	0.13	0.3
Pancreas	0.11	0.15	0.14	0.19	0.18	0.24	1.0
Stomach Wall	0.32	0.42	0.37	0.48	0.42	0.53	0.5
Small Intestine	0.23	0.27	0.29	0.33	0.35	0.39	0.5
Colon (Upper)[c]	0.29	0.32	0.36	0.39	0.42	0.45	0.5
Colon (Lower)[d]	0.14	0.15	0.17	0.19	0.20	0.22	0.7
Ovaries	-	0.18	-	0.24	-	0.29	2.0
Uterus	-	0.24	-	0.30	-	0.36	1.0
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.03	0.03	0.04	0.04	0.3
Skeleton	0.03	0.04	0.04	0.05	0.05	0.06	0.3
Surface (entr.)	1.22	1.20	1.23	1.28	1.30	1.29	1.0
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.03	7.5

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 31: KIDNEYS a.p.

Field size	30 cm x 24 cm	Focus-to-film distance	115 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	0.11	-	0.12	-	0.13	0.5
Lungs	0.03	0.07	0.04	0.08	0.04	0.09	0.5
Spleen	0.06	0.08	0.09	0.11	0.11	0.14	1.0
Pancreas	0.14	0.17	0.18	0.21	0.22	0.26	1.0
Stomach Wall	0.40	0.44	0.47	0.50	0.53	0.57	0.5
Small Intestine	0.04	0.02	0.05	0.03	0.07	0.04	0.5
Colon (Upper)[c]	0.08	0.04	0.11	0.05	0.13	0.07	0.7
Colon (Lower)[d]	**	**	**	**	0.01	**	2.0
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.01	0.01	0.01	0.02	0.02	0.02	0.2
Skeleton	0.03	0.05	0.04	0.05	0.04	0.06	0.2
Surface (entr.)	1.17	1.14	1.20	1.19	1.24	1.23	1.0
Surface (exit)	0.01	0.01	0.01	0.01	0.02	0.02	5.5

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 32: BLADDER a.p.

Field size	24 cm x 18 cm	Focus-to-film distance	115 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	0.01	0.01	0.02	0.02	0.02	1.0
Colon (Upper)[c]	**	0.01	0.01	0.02	0.01	0.02	1.5
Colon (Lower)[d]	0.08	0.11	0.11	0.14	0.13	0.16	0.5
Ovaries	-	0.07	-	0.09	-	0.11	2.0
Uterus	-	0.13	-	0.16	-	0.19	1.0
Testes	0.14	-	0.16	-	0.18	-	1.0
Red Bone Marrow	**	**	**	**	0.01	0.01	0.5
Skeleton	**	0.01	0.01	0.02	0.01	0.02	0.3
Surface (entr.)	1.18	1.18	1.22	1.21	1.25	1.24	0.5
Surface (exit)	0.01	0.02	0.02	0.02	0.02	0.03	3.5

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 33: GALL BLADDER p.a.

Field size	24 cm x 30 cm	Focus-to-film distance	115 cm
Patient thickness ♀	15 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	16 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	0.02	**	0.03	0.01	0.03	0.6
Spleen	**	**	**	**	**	**	-
Pancreas	0.02	0.02	0.02	0.03	0.03	0.04	1.5
Stomach Wall	**	**	**	**	**	0.01	2.1
Small Intestine	0.05	0.05	0.07	0.07	0.08	0.08	0.4
Colon (Upper)[c]	0.05	0.06	0.07	0.08	0.09	0.10	0.7
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	0.01	-	0.02	5.1
Uterus	-	**	-	0.01	-	0.01	2.6
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.03	0.03	0.04	0.03	0.2
Skeleton	0.05	0.06	0.06	0.07	0.07	0.08	0.1
Surface (entr.)	1.20	1.19	1.23	1.22	1.26	1.26	0.6
Surface (exit)	0.02	0.03	0.03	0.04	0.04	0.05	2.9

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 34: GALL BLADDER p.a. (Spot Film)

Field size	10 cm x 15 cm	Focus-to-film distance	60 cm
Patient thickness ♀	15 cm	Focus-to-skin distance	40 cm
Patient thickness ♂	16 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	60 kV		70 kV		80 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	0.01	**	0.01	**	0.01	0.01	0.4
Colon (Upper)[c]	0.01	0.01	0.02	0.01	0.02	0.02	0.6
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	**	**	**	**	**	**	-
Skeleton	**	**	**	**	**	**	-
Surface (entr.)	1.11	1.11	1.13	1.13	1.15	1.15	0.3
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.03	2.1

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 35: STOMACH p.a.

Field size	24 cm x 30 cm	Focus-to-film distance	60 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	40 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		110 kV		130 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	0.02	-	0.03	-	0.03	0.9
Lungs	0.05	0.07	0.06	0.08	0.07	0.09	0.4
Spleen	0.43	0.48	0.47	0.52	0.53	0.58	0.3
Pancreas	0.19	0.22	0.23	0.26	0.27	0.30	0.6
Stomach Wall	0.11	0.13	0.13	0.15	0.16	0.18	0.6
Small Intestine	0.06	0.07	0.07	0.08	0.08	0.10	0.4
Colon (Upper)[c]	0.05	0.06	0.06	0.07	0.07	0.09	0.7
Colon (Lower)[d]	0.02	0.02	0.02	0.02	0.02	0.03	1.4
Ovaries	-	0.01	-	0.01	-	0.02	5.3
Uterus	-	0.01	-	0.01	-	0.02	2.5
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.05	0.06	0.06	0.07	0.07	0.08	0.2
Skeleton	0.09	0.10	0.09	0.11	0.10	0.12	0.1
Surface (entr.)	1.24	1.23	1.25	1.27	1.29	1.30	0.6
Surface (exit)	0.03	0.03	0.03	0.04	0.04	0.05	3.2

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 36: DUODENUM p.a. (Spot Film)

Field size	15 cm x 12 cm	Focus-to-film distance	60 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	40 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		110 kV		130 kV		ε[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.01	0.02	0.01	0.02	0.02	0.03	1.0
Pancreas	0.03	0.05	0.03	0.06	0.04	0.07	1.0
Stomach Wall	0.02	0.03	0.02	0.03	0.03	0.04	1.0
Small Intestine	0.02	0.02	0.03	0.02	0.03	0.02	0.5
Colon (Upper)[c]	0.03	0.02	0.03	0.02	0.04	0.03	0.5
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.02	0.02	0.02	0.03	0.03	0.03	0.2
Skeleton	0.02	0.03	0.03	0.03	0.03	0.04	0.2
Surface (entr.)	1.15	1.16	1.17	1.17	1.19	1.18	0.5
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.02	3.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 37: STOMACH p.a. (With Contrast)

Field size	24 cm x 30 cm	Focus-to-film distance	60 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	40 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		110 kV		130 kV		ε[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	0.02	-	0.03	-	0.04	1.2
Lungs	0.05	0.07	0.06	0.08	0.07	0.09	0.5
Spleen	0.42	0.47	0.46	0.52	0.52	0.57	0.5
Pancreas	0.19	0.21	0.22	0.25	0.26	0.29	0.9
Stomach Wall	0.07	0.08	0.08	0.09	0.09	0.11	1.0
Small Intestine	0.06	0.07	0.07	0.08	0.08	0.10	0.6
Colon (Upper)[c]	0.05	0.06	0.06	0.07	0.07	0.09	1.0
Colon (Lower)[d]	0.02	0.02	0.02	0.02	0.02	0.03	2.0
Ovaries	-	0.01	-	0.02	-	0.02	7.7
Uterus	-	0.01	-	0.01	-	0.02	3.6
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.05	0.06	0.06	0.07	0.07	0.08	0.2
Skeleton	0.09	0.10	0.09	0.11	0.10	0.12	0.2
Surface (entr.)	1.24	1.23	1.25	1.26	1.28	1.30	0.9
Surface (exit)	0.01	0.01	0.01	0.02	0.02	0.02	6.5

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 38: COLON CONTRAST ENEMA p.a.

Field size	30 cm x 40 cm	Focus-to-film distance	115 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	85 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		110 kV		130 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.03	0.06	0.03	0.08	0.03	0.09	2.1
Pancreas	0.02	0.04	0.02	0.04	0.03	0.05	2.9
Stomach Wall	0.03	0.06	0.04	0.07	0.05	0.08	2.0
Small Intestine	0.18	0.21	0.22	0.24	0.26	0.29	0.5
Colon (Upper)[c]	0.10	0.11	0.12	0.14	0.14	0.16	1.0
Colon (Lower)[d]	0.13	0.15	0.16	0.18	0.19	0.21	1.0
Ovaries	-	0.26	-	0.30	-	0.37	2.7
Uterus	-	0.23	-	0.27	-	0.32	1.2
Testes	0.03	-	0.04	-	0.05	-	4.5
Red Bone Marrow	0.16	0.17	0.19	0.20	0.22	0.24	0.2
Skeleton	0.15	0.17	0.17	0.19	0.18	0.21	0.2
Surface (entr.)	1.27	1.25	1.29	1.26	1.31	1.35	1.2
Surface (exit)	0.03	0.03	0.04	0.05	0.05	0.06	6.0

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 39: COLON CONTRAST ENEMA p.a. (Spot Film)

Field size	24 cm x 30 cm	Focus-to-film distance	60 cm
Patient thickness ♀	19 cm	Focus-to-skin distance	40 cm
Patient thickness ♂	20 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		110 kV		130 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.05	0.12	0.06	0.13	0.07	0.15	1.2
Pancreas	0.02	0.03	0.02	0.04	0.03	0.05	2.3
Stomach Wall	0.05	0.07	0.05	0.09	0.07	0.10	1.3
Small Intestine	0.09	0.09	0.10	0.10	0.11	0.12	0.5
Colon (Upper)[c]	0.03	0.03	0.04	0.04	0.04	0.05	1.4
Colon (Lower)[d]	0.07	0.08	0.09	0.09	0.10	0.11	1.1
Ovaries	-	0.09	-	0.11	-	0.14	3.5
Uterus	-	0.04	-	0.05	-	0.07	2.0
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.05	0.05	0.06	0.06	0.07	0.07	0.3
Skeleton	0.06	0.07	0.07	0.07	0.07	0.08	0.2
Surface (entr.)	1.38	1.34	1.40	1.39	1.42	1.41	0.9
Surface (exit)	0.04	0.06	0.05	0.08	0.07	0.09	3.8

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 40: COLON CONTRAST ENEMA lat. (Spot Film)

Field size	24 cm x 30 cm	Focus-to-film distance	80 cm
Patient thickness ♀	33 cm	Focus-to-skin distance	40 cm
Patient thickness ♂	35 cm	Total filtration	2.5 mm Al

Mean Organ Dose (mSv) / Entrance Dose (mGy)[a]

Tube Voltage	90 kV		110 kV		130 kV		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	0.02	0.03	0.02	0.03	0.03	0.04	0.7
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	0.08	0.10	0.10	0.11	0.11	0.13	0.7
Ovaries	-	0.03	-	0.04	-	0.05	3.8
Uterus	-	0.03	-	0.04	-	0.05	1.6
Testes	**	-	0.01	-	0.01	-	4.3
Red Bone Marrow	0.03	0.03	0.03	0.04	0.04	0.04	0.3
Skeleton	0.03	0.03	0.03	0.04	0.03	0.04	0.2
Surface (entr.)	1.24	1.24	1.26	1.26	1.30	1.28	0.6
Surface (exit)	**	**	**	**	**	**	-

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
** Less than 0.01 mSv/mGy

Table 41: COMPUTER TOMOGRAPHY PELVIS (20 Slices[e])
(360° Rotation of Fan Beam)

Field size	40 cm x 0.8 cm	Focus-to-axis distance	85 cm
Patient thickness ♂	20/40 cm	Total filtration:	
Patient thickness ♀	19/38 cm	(1) 2.5 mm Al + 0.25 mm Cu	
		(2) 6.0 mm Al	

Mean Organ Dose (mSv) / Central Axis Dose (mGy)[a]

Tube Voltage	100 kV (1)		125 kV (1)		120 kV (2)		%[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	0.01	0.02	0.01	0.02	0.01	0.01	2.1
Pancreas	0.01	0.01	0.01	0.02	0.01	0.01	2.5
Stomach Wall	0.02	0.03	0.03	0.03	0.02	0.03	1.4
Small Intestine	0.29	0.34	0.32	0.38	0.27	0.32	0.2
Colon (Upper)[c]	0.25	0.31	0.27	0.34	0.23	0.28	0.4
Colon (Lower)[d]	0.30	0.33	0.33	0.36	0.27	0.30	0.4
Ovaries	-	0.38	-	0.46	-	0.37	1.3
Uterus	-	0.40	-	0.44	-	0.36	0.6
Testes	0.03	-	0.04	-	0.03	-	2.5
Red Bone Marrow	0.13	0.14	0.14	0.16	0.12	0.13	0.2
Skeleton	0.14	0.16	0.15	0.16	0.13	0.14	0.1
Surface	0.60	0.61	0.61	0.62	0.60	0.60	0.2

[a] If using old units: 1 mSv/mGy = 0.869 rem/R
[b] Percentage Mean Error
[c] Caecum + Ascending + Transverse
[d] Descending + Sigmoid + Rectum
[e] Pelvis scan from bottom of bladder to sacrum
** Less than 0.01 mSv/mGy

Table 42: COMPUTER TOMOGRAPHY LIVER (20 Slices[e])

(360° Rotation of Fan Beam)

Field size 40 cm x 0.8 cm

Patient thickness ♂ 20/40 cm

Patient thickness ♀ 19/38 cm

Focus-to-axis distance 85 cm

Total filtration:
(1) 2.5 mm Al + 0.25 mm Cu
(2) 6.0 mm Al

Mean Organ Dose (mSv) / Central Axis Dose (mGy)[a]

Tube Voltage	100 kV (1)		125 kV (1)		120 kV (2)		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	**	**	**	**	**	**	-
Breast	-	0.06	-	0.06	-	0.06	0.6
Lungs	0.10	0.12	0.10	0.13	0.09	0.11	0.3
Spleen	0.47	0.49	0.51	0.53	0.43	0.45	0.4
Pancreas	0.37	0.40	0.41	0.44	0.34	0.36	0.6
Stomach Wall	0.46	0.49	0.50	0.52	0.43	0.45	0.4
Small Intestine	0.11	0.14	0.13	0.15	0.11	0.13	0.3
Colon (Upper)[c]	0.17	0.21	0.19	0.23	0.15	0.20	0.5
Colon (Lower)[d]	0.02	0.03	0.03	0.03	0.02	0.03	1.4
Ovaries	-	0.03	-	0.03	-	0.02	4.5
Uterus	-	0.02	-	0.03	-	0.02	2.1
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.06	0.07	0.07	0.08	0.06	0.06	0.2
Skeleton	0.17	0.18	0.17	0.18	0.15	0.17	0.1
Surface	0.60	0.61	0.61	0.62	0.59	0.61	0.2

a If using old units: 1 mSv/mGy = 0.869 rem/R

b Percentage Mean Error

c Caecum + Ascending + Transverse

d Descending + Sigmoid + Rectum

e Liver scan: Central slice at centre of liver

** Less than 0.01 mSv/mGy

Table 43: COMPUTER TOMOGRAPHY LUNG (15 Slices[e])

(360° Rotation of Fan Beam)

Field size 40 cm x 0.8 cm

Patient thickness ♂ 20/40 cm

Patient thickness ♀ 19/38 cm

Focus-to-axis distance 85 cm

Total filtration:
(1) 2.5 mm Al + 0.25 mm Cu
(2) 6.0 mm Al

Mean Organ Dose (mSv) / Central Axis Dose (mGy)[a]

Tube Voltage	100 kV (1)		125 kV (1)		120 kV (2)		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.06	0.06	0.07	0.08	0.05	0.06	2.5
Breast	-	0.16	-	0.17	-	0.15	0.4
Lungs	0.25	0.28	0.27	0.30	0.23	0.25	0.2
Spleen	0.01	0.01	0.01	0.02	0.01	0.01	2.2
Pancreas	0.01	0.02	0.01	0.02	0.01	0.01	2.5
Stomach Wall	**	0.01	0.01	0.01	**	0.01	2.2
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.07	0.08	0.08	0.09	0.07	0.08	0.1
Skeleton	0.21	0.23	0.21	0.23	0.19	0.21	0.1
Surface	0.60	0.60	0.61	0.62	0.59	0.60	0.3

a If using old units: 1 mSv/mGy = 0.869 rem/R

b Percentage Mean Error

c Caecum + Ascending + Transverse

d Descending + Sigmoid + Rectum

e Lung scan: First slice at top of lungs

** Less than 0.01 mSv/mGy

Table 44: COMPUTER TOMOGRAPHY LUNG (25 Slices[e])

(360° Rotation of Fan Beam)

Field size 40 cm x 0.8 cm

Patient thickness ♂ 20/40 cm

Patient thickness ♀ 19/38 cm

Focus-to-axis distance 85 cm

Total filtration:
(1) 2.5 mm Al + 0.25 mm Cu
(2) 6.0 mm Al

Mean Organ Dose (mSv) / Central Axis Dose (mGy)[a]

Tube Voltage	100 kV (1)		125 kV (1)		120 kV (2)		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	**	**	**	**	**	**	-
Eyelenses	**	**	**	**	**	**	-
Thyroid	0.06	0.07	0.07	0.08	0.06	0.06	2.4
Breast	-	0.59	-	0.62	-	0.57	0.2
Lungs	0.52	0.54	0.56	0.57	0.48	0.50	0.2
Spleen	0.06	0.09	0.06	0.10	0.05	0.08	1.0
Pancreas	0.06	0.09	0.07	0.10	0.06	0.08	1.1
Stomach Wall	0.05	0.08	0.05	0.08	0.05	0.07	1.0
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.11	0.12	0.12	0.13	0.10	0.11	0.1
Skeleton	0.33	0.36	0.33	0.36	0.30	0.32	0.1
Surface	0.60	0.60	0.62	0.62	0.59	0.60	0.2

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
e Lung scan: First slice at top of lungs
** Less than 0.01 mSv/mGy

Table 45: COMPUTER TOMOGRAPHY HEAD (15 Slices[e])

(360° Rotation of Fan Beam)

Field size 40 cm x 0.8 cm

Patient thickness ♂ 20/40 cm

Patient thickness ♀ 19/38 cm

Focus-to-axis distance 85 cm

Total filtration:
(1) 2.5 mm Al + 0.25 mm Cu
(2) 6.0 mm Al

Mean Organ Dose (mSv) / Central Axis Dose (mGy)[a]

Tube Voltage	100 kV (1)		125 kV (1)		120 kV (2)		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.45	0.48	0.50	0.52	0.42	0.44	0.2
Eyelenses	0.63	0.63	0.65	0.65	0.59	0.60	1.7
Thyroid	0.03	0.04	0.04	0.05	0.03	0.04	3.2
Breast	-	**	-	**	-	**	-
Lungs	**	**	**	**	**	**	-
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.06	0.06	0.07	0.07	0.06	0.06	0.1
Skeleton	0.17	0.18	0.17	0.18	0.15	0.17	0.1
Surface	0.63	0.63	0.64	0.65	0.62	0.63	0.3

a If using old units: 1 mSv/mGy = 0.869 rem/R
b Percentage Mean Error
c Caecum + Ascending + Transverse
d Descending + Sigmoid + Rectum
e Head scan: First slice at top of skull
** Less than 0.01 mSv/mGy

Table 46: COMPUTER TOMOGRAPHY HEAD (25 Slices[e])

(360° Rotation of Fan Beam)

Field size 40 cm x 0.8 cm

Patient thickness ♂ 20/40 cm

Patient thickness ♀ 19/38 cm

Focus-to-axis distance 85 cm

Total filtration:
(1) 2.5 mm Al + 0.25 mm Cu
(2) 6.0 mm Al

Mean Organ Dose (mSv) / Central Axis Dose (mGy)[a]

Tube Voltage	100 kV (1)		125 kV (1)		120 kV (2)		s[b]
Organ	♂	♀	♂	♀	♂	♀	
Brain	0.47	0.49	0.52	0.54	0.43	0.45	0.2
Eyelenses	0.64	0.64	0.66	0.66	0.60	0.60	1.6
Thyroid	0.68	0.73	0.70	0.77	0.62	0.67	0.9
Breast	-	**	-	**	-	**	-
Lungs	0.02	0.02	0.02	0.02	0.01	0.02	0.7
Spleen	**	**	**	**	**	**	-
Pancreas	**	**	**	**	**	**	-
Stomach Wall	**	**	**	**	**	**	-
Small Intestine	**	**	**	**	**	**	-
Colon (Upper)[c]	**	**	**	**	**	**	-
Colon (Lower)[d]	**	**	**	**	**	**	-
Ovaries	-	**	-	**	-	**	-
Uterus	-	**	-	**	-	**	-
Testes	**	-	**	-	**	-	-
Red Bone Marrow	0.08	0.09	0.09	0.11	0.08	0.09	0.1
Skeleton	0.23	0.26	0.24	0.26	0.21	0.24	0.1
Surface	0.63	0.63	0.64	0.65	0.62	0.63	0.3

[a] If using old units: 1 mSv/mGy = 0.869 rem/R

[b] Percentage Mean Error

[c] Caecum + Ascending + Transverse

[d] Descending + Sigmoid + Rectum

[e] Head scan: First slice at top of skull

** Less than 0.01 mSv/mGy