Embargo until 23 May 2016

APPENDIX to Examination
Coordinating Expert Radiation Protection

Nuclear Research and consultancy Group	NRG
Delft University of Technology	TUD
Boerhaave CME/Leiden University Medical Centre	BN/LUMC
University of Groningen	RUG
Radboud University Medical Centre	RUMC
Eindhoven University of Technology	TU/e

date of examination: 23 May 2016
time of examination: 13.30 - 16.30

Instructions

- **If you use data other than those given in this Appendix, state the source!**
- **This Appendix comprises eight consecutively numbered pages. Check that it is complete!**
- **Where a comma is used in the numbers in the non-translated Dutch figures and graphs of the appendix a decimal point should be read.**

CONTENTS

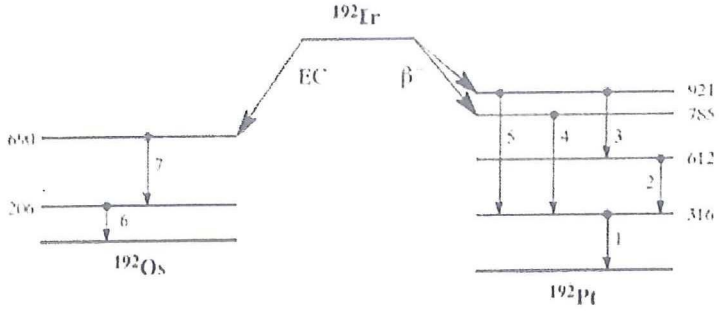
Handboek Radionucliden, A.S. Keverling Buisman (2nd edition 2007), p. 214, data on ^{192}Ir

^{192}Ir Z = 77

Half-life and decay constant

$T_{1/2}$ = 73,83 d = 6,38×10^{6} s λ = 1,09×10^{-7} s^{-1}

Decay scheme (simplified)



Main emitted radiation

Straling	y (Bq·s)$^{-1}$	E (keV)	Straling	y (Bq·s)$^{-1}$	E (keV)
β^-	0,415	161 | 536	γ_4	0,478	468
β^-	0,481	209 | 672	γ_5	0,082	604
γ_1	0,828	316	γ_6	0,033	206
γ_2	0,290	296	γ_7	0,032	485
γ_3	0,297	308			

Source constants

Air kerma rate = 0,11 μGy/h per MBq/m^2
Ambient dose equivalent rate = 0,14 μSv/h per MBq/m^2

Miscellaneous

Specific activity	3,41×10^{14} Bq/g
Exemption levels	10^3 Bq/g en A_1 = 10^3 Bq
Skin contamination	5×10^{-10} Sv/s per Bq/cm^2
Wound contamination / injection	7,0×10^{-9} Sv/Bq
Transport	1 TBq
	0,6 TBq

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Detailed curve of broad beam transmission of photons from ^{192}Ir through lead (SBD-TU/e)

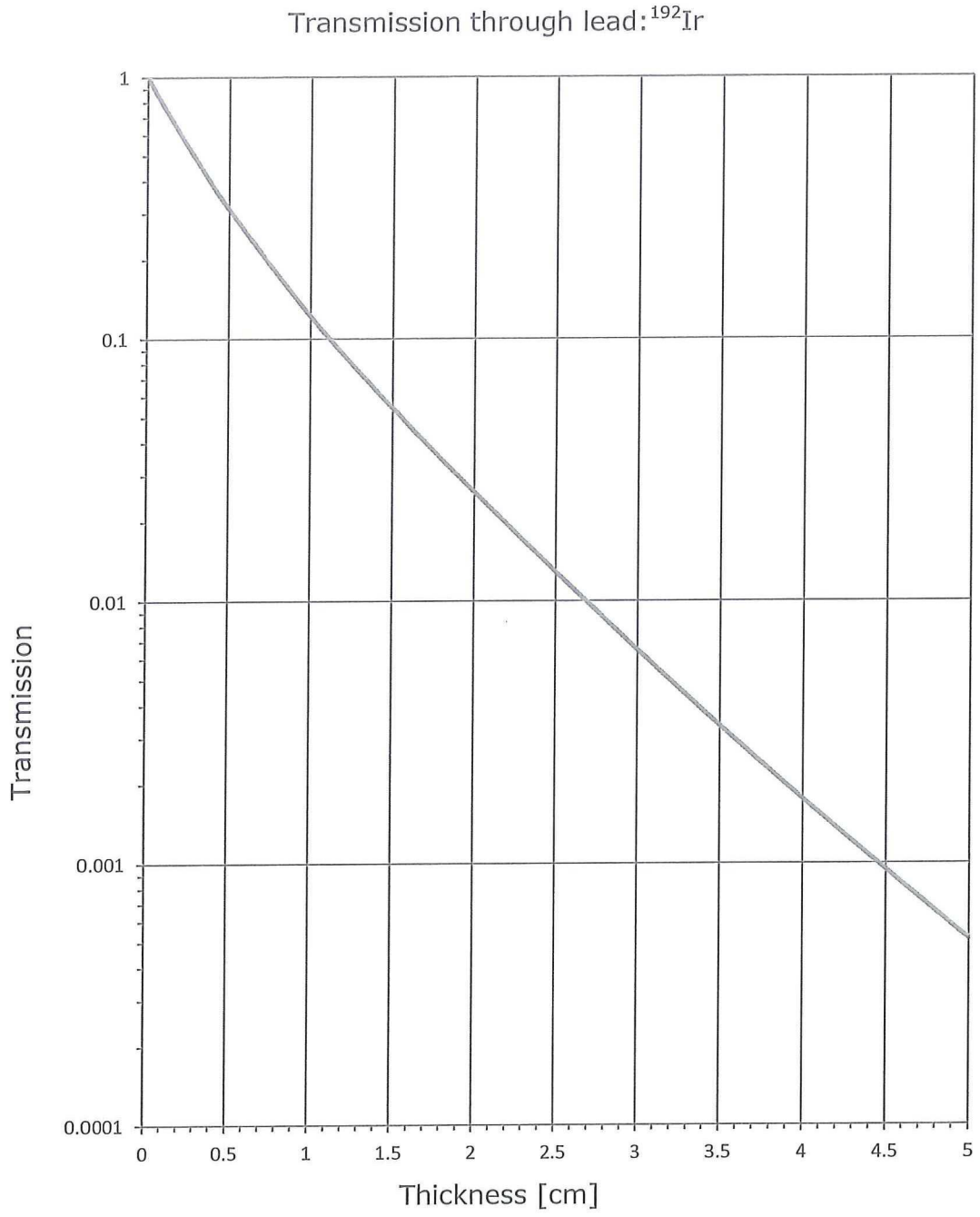
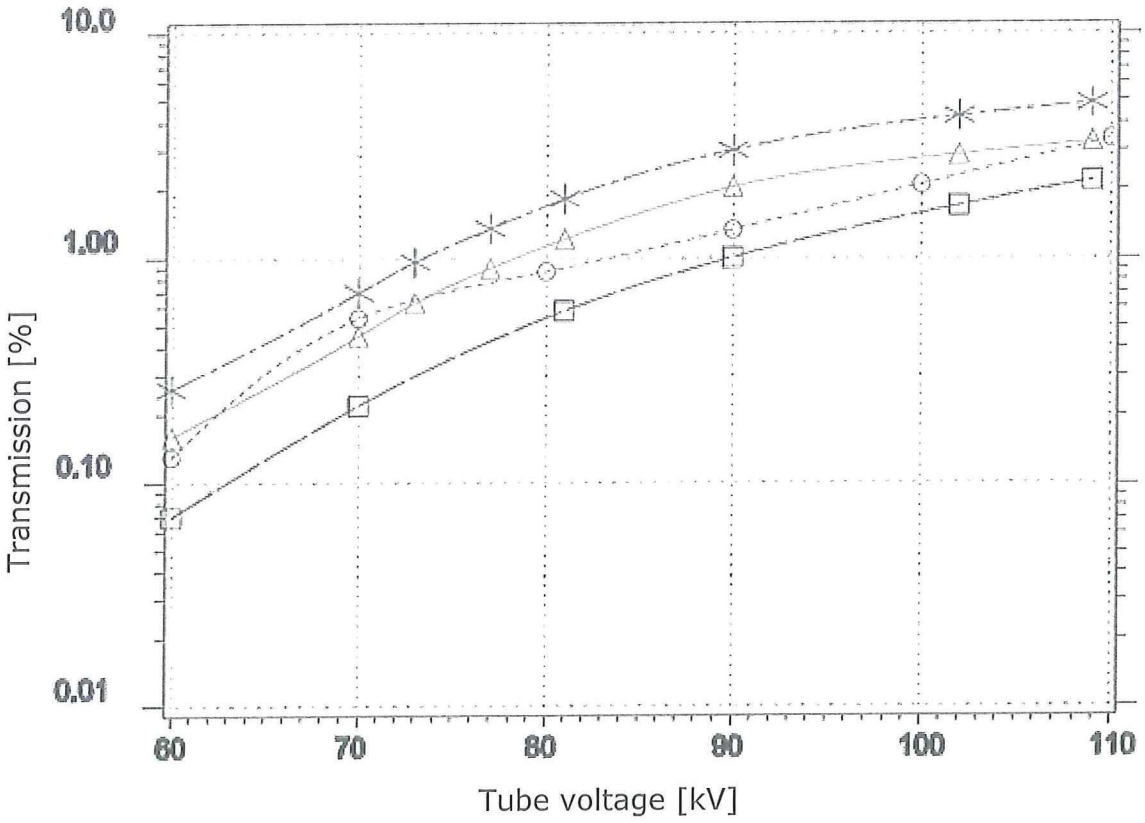


Figure 6-2: Experimentally determined transmission of direct and scattered X-rays through a 0.50 mm lead-equivalent apron as a function of tube voltage (from Report 17 of the Netherlands Commission on Radiation Dosimetry, *Dosimetrie in de Radiologie: Stralingsbelasting van de Patiënt en Werknemers* [Dosimetry in Radiology: Radiation Exposure of Patients and Workers] (2007))

The lines show transmission in four different situations:
□ = *90° Scattered radiation in a perspex phantom*
O = 90° Scattered radiation in a wax phantom
Δ= Primary beam, narrow beam geometry
X = Primary beam, broad beam geometry



Graph of interaction coefficients for photons, lead 0.0010 MeV – 0.2 MeV (based on Table D in *Inleiding tot de Stralingshygiëne*, Bos et al. (2nd edition 2007))

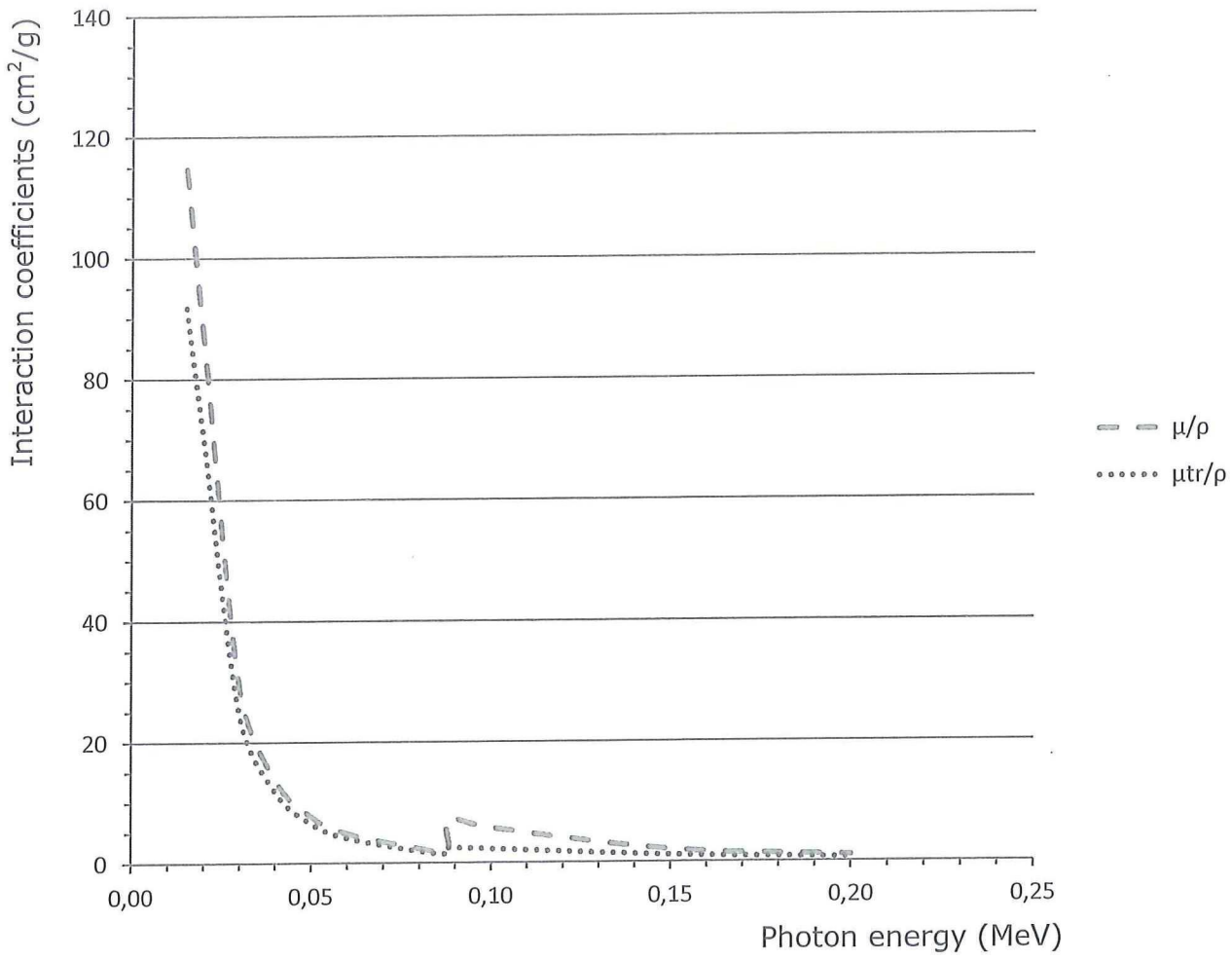
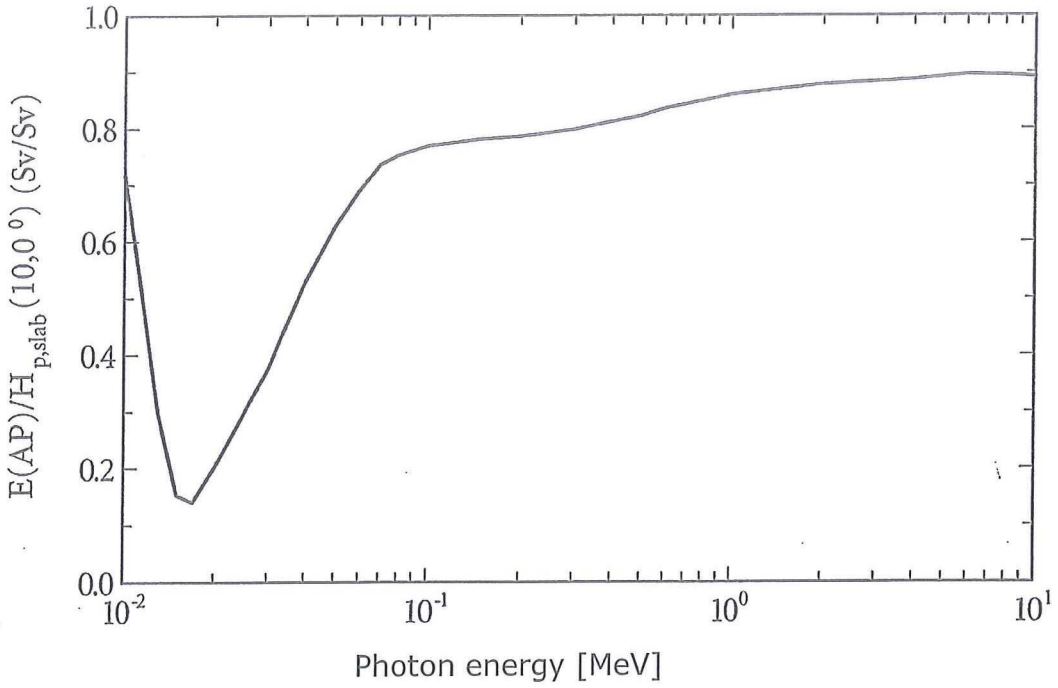


Figure 6.9 in *Inleiding tot de Stralingshygiëne*, Bos et al. (2nd edition 2007):
Ratio between effective dose E and personal dose equivalent $H_{p,\,slab}(10.\ 0°)$ as a function of photon energy in the AP radiation geometry (from ICRP-74)



Tissue weighting factors according to ICRP-60

Organ or tissue	***Tissue weighting factor*** w_T
Gonads	0.20
Bone marrow (red)	0.12
Large intestine	0.12
Lung	0.12
Stomach	0.12
Bladder	0.05
Chest	0.05
Liver	0.05
Oesophagus	0.05
Thyroid	0.05
Skin	0.01
Bone surface	0.01
Other*	0.05
Total	***1***

* 'Other' includes brain, small intestine, upper large intestine, kidneys, muscle tissue, pancreas, spleen, thymus and uterus.