

Ionizing Radiation Dose Ranges (Sievert)



Office of Science
U.S. DEPARTMENT OF ENERGY

Evidence for small increases in human cancer above 100 mSv acute exposure or 200 mSv chronic exposure

Typical mission doses on International Space Station (ISS)

Kerala coast, India high natural bkg/yr

Typical added annual dose for commercial airline flight crews

Airport x-ray whole body scanner:
0.00007 mSv/scan
(Limit = 0.25 mSv/yr ≈ 4000 scans/yr)

Round-trip Los Angeles - New York (≈ 0.037 mSv)

EPA dose limit public drinking water systems: 0.04 mSv/yr

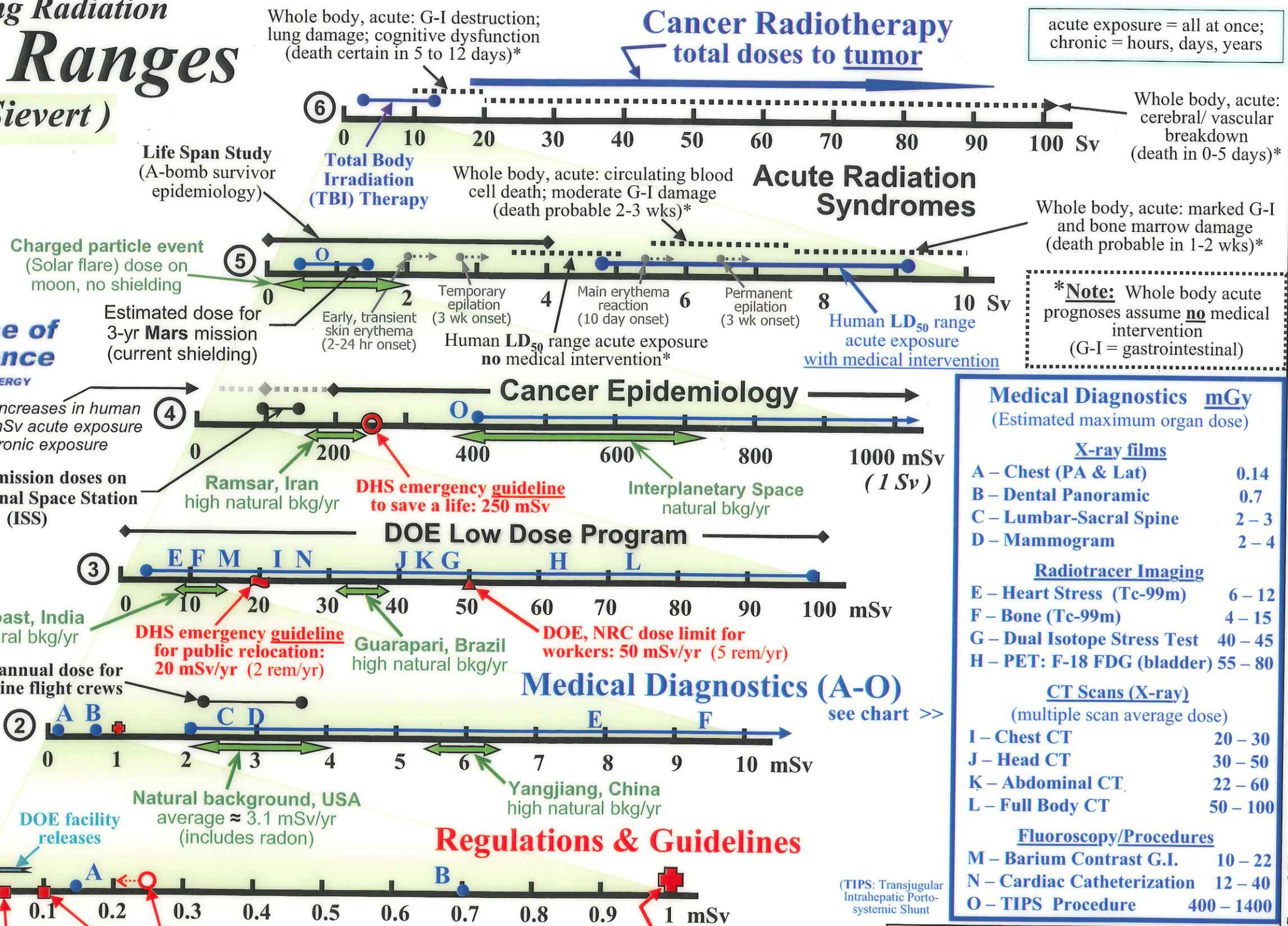
EPA dose limit from release in air: 0.1 mSv/yr

NRC cleanup criteria for site decommissioning / unrestricted use: 0.25 mSv/yr

DOE, NRC dose limit for the public: 1 mSv/yr (100 mrem/yr) (ICRP, NCRP)

Regulations & Guidelines

NOTE: This chart was constructed with the intention of providing a simple, user-friendly, "order-of-magnitude" reference for radiation exposures of interest to scientists, managers, and the general public. In that spirit, most quantities are expressed as "dose equivalent" in the more commonly used radiation protection units, the rem and Sievert. Medical diagnostics are expressed as estimated maximum organ dose; as they are not in "effective dose" they do not imply an estimation of risk (no tissue weighting). Dose limits are in effective dose, but for most radiation types and energies the difference is numerically not significant within this context. It is acknowledged that the decision to use these units is a simplification, and does not address everyone's needs. (NRC = Nuclear Regulatory Commission; EPA = Environmental Protection Agency; DHS = Department of Homeland Security)
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acute exposure = all at once;
chronic = hours, days, years

Whole body, acute: cerebral/vascular breakdown (death in 0-5 days)*

Whole body, acute: marked G-I and bone marrow damage (death probable in 1-2 wks)*

***Note:** Whole body acute prognoses assume no medical intervention (G-I = gastrointestinal)

Medical Diagnostics mGy (Estimated maximum organ dose)	
<u>X-ray films</u>	
A - Chest (PA & Lat)	0.14
B - Dental Panoramic	0.7
C - Lumbar-Sacral Spine	2 - 3
D - Mammogram	2 - 4
<u>Radiotracer Imaging</u>	
E - Heart Stress (Tc-99m)	6 - 12
F - Bone (Tc-99m)	4 - 15
G - Dual Isotope Stress Test	40 - 45
H - PET: F-18 FDG (bladder)	55 - 80
<u>CT Scans (X-ray) (multiple scan average dose)</u>	
I - Chest CT	20 - 30
J - Head CT	30 - 50
K - Abdominal CT	22 - 60
L - Full Body CT	50 - 100
<u>Fluoroscopy/Procedures</u>	
M - Barium Contrast G.I.	10 - 22
N - Cardiac Catheterization	12 - 40
O - TIPS Procedure	400 - 1400

LD₅₀ = Lethal Dose to 50%
(whole body dose that results in lethality to 50% of exposed individuals in 30-60 days)

Dose Equivalent: 1 Sievert = 100 rem
= (absorbed dose x radiation quality)
Absorbed Dose: 1 Gray = 100 rad
1 Sv ≈ 1 Gy for x- and gamma-rays
(" ≈ " stands for "approximately equal to")

Chart compiled by NF Metting, Office of Science, DOE/BER. "Orders of Magnitude" revised June 2010
<http://www.lowdose.energy.gov/>

Source: Office of Biological and Environmental Research (BER), Office of Science, U.S. Department of Energy
<http://www.science.doe.gov/ober/>