Radiation Dose Rate Chart

µSv/h, mrem/h and mR/h with yearly totals, time to 1 mSv and reference levels

For: Radiation safety staff, survey-meter and Geiger counter users, students and travellers

allunitconversions.com/radiation-dose-rate-chart
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EXACT DEFINITION	FORMULA	REVERSE	WORKED EXAMPLE
1 µSv/h = 0.1 mrem/h = 100 µrem/h (exact)	mSv per year = µSv/h × 8.766 (continuous exposure)	µSv/h = mrem/h × 10	0.2 µSv/h for a whole year = 0.2 × 8.766 = 1.75 mSv

Values use 4 significant figures (time to 1 mSv: 3). A year is taken as 8,766 hours (365.25 days).

Microsieverts per hour to mrem/h, yearly dose and time to 1 mSv

Dose rate (µSv/h)	mrem/h (≈ mR/h for gamma)	mSv per year (continuous)	Hours to receive 1 mSv
0.01	0.001	0.08766	100,000
0.05	0.005	0.4383	20,000
0.1	0.01	0.8766	10,000
0.15	0.015	1.315	6,670
0.2	0.02	1.753	5,000
0.3	0.03	2.63	3,330
0.5	0.05	4.383	2,000
1	0.1	8.766	1,000
2	0.2	17.53	500
3	0.3	26.3	333
5	0.5	43.83	200
10	1	87.66	100
20	2	175.3	50
50	5	438.3	20
100	10	876.6	10
250	25	2,192	4
500	50	4,383	2
1,000	100	8,766	1
10,000	1,000	87,660	0.1

mrem/h (or mR/h for gamma) to µSv/h

Dose rate (mrem/h)	µSv/h	mSv/h
0.001	0.01	1×10^{-5}
0.002	0.02	2×10^{-5}
0.005	0.05	5×10^{-5}
0.01	0.1	1×10^{-4}
0.02	0.2	2×10^{-4}
0.05	0.5	5×10^{-4}
0.1	1	0.001
0.2	2	0.002
0.5	5	0.005

Dose rate (mrem/h)	µSv/h	mSv/h
1	10	0.01
2	20	0.02
5	50	0.05
10	100	0.1
25	250	0.25
50	500	0.5
100	1,000	1
1,000	10,000	10

Dose units for rate readings

From	To	Multiply by
Microsieverts (µSv)	Millirem (mrem)	0.1
Millirem (mrem)	Microsieverts (µSv)	10
Millisieverts (mSv)	Millirem (mrem)	100
Rem (rem)	Millisieverts (mSv)	10

Reference doses as average dose rates

Reference	Dose	Average rate
Public dose limit, planned exposures (ICRP 103)	1 mSv per year	0.114 µSv/h, continuous
World average natural background (UNSCEAR 2008)	2.4 mSv per year	0.27 µSv/h averaged over a year
UK average, all sources (UKHSA)	2.6 mSv per year	0.30 µSv/h averaged over a year
US average, including medical (NCRP 160)	6.2 mSv per year	0.71 µSv/h averaged over a year
Occupational limit (ICRP 103)	20 mSv per year	10 µSv/h over 2,000 working hours

Reading a survey meter or Geiger counter

Point	What to know
Counts per minute (CPM)	CPM is not a dose rate. The conversion depends on the tube and the isotope; use the factor in your meter's manual.
µR/h and µSv/h	For gamma rays, 1 µR/h ≈ 0.01 µSv/h is a common approximation (1 R = 8.76 mGy air kerma).
Background readings	Averages above include radon breathed in, which a gamma meter does not detect, so typical meter readings are lower.
Dose from a rate	Dose (µSv) = dose rate (µSv/h) × time (h).
Distance	From a small source, the dose rate falls with the square of distance: twice as far gives a quarter of the rate.

Sources and method

- **NIST Special Publication 811** — Guide for the Use of the International System of Units (www.nist.gov/pml/special-publication-811)
- **ICRP Publication 103 (2007)** — Radiation weighting factors and dose limits; lens of the eye per ICRP Publication 118 (2011) (www.icrp.org/publication.asp?id=ICRP%20Publication%20103)
- **UNSCEAR 2008 Report, Volume I** — World average natural background 2.4 mSv per year (www.unscear.org/unscear/en/publications/2008_1.html)
- **UKHSA, Ionising radiation: dose comparisons (updated 28 September 2026)** — Contains public sector information licensed under the Open Government Licence v3.0 (www.gov.uk/government/publications/ionising-radiation-dose-comparisons/ionising-radiation-dose-comparisons)
- **NCRP Report No. 160 (2009)** — US average annual exposure 6.2 mSv, including medical
- **ICRU Report 90 (2016)** — W(air)/e = 33.97 J/C, so 1 R = 8.764 mGy air kerma

Rate conversions follow from 1 Sv = 100 rem exactly; yearly totals use 8,766 hours; reference doses are quoted from the sources listed and converted to average rates. Interactive version, corrections and more charts: **allunitconversions.com/radiation-dose-rate-chart**