

Table of doses to sphere of tissue 30 micron radius by one particle of U₃O₈ of various diameters

Particle diameter	Particle vol. cm³	Mass U₃O₈ (g)	Mass U238 (g)	Activity of particle Bq	Hits /day (dose/day)	Hits/year (dose/year)
0.2 μ	4.2 x 10⁻¹⁵	3.6 x 10⁻¹⁴	3.06 x 10⁻¹⁴	3.8 x 10⁻¹⁰	3.3 x 10⁻⁵ (3.96 x 10⁻³mSv)	0.012 (1.44mSv)
0.5 μ	6.5 x 10⁻¹⁴	5.6 x 10⁻¹³	4.8 x 10⁻¹³	5.9 x 10⁻⁹	5.1 x 10⁻⁴ (0.06mSv)	0.186 (21.9mSv)
1.0 μ	5.2 x 10⁻¹³	4.3 x 10⁻¹²	3.7 x 10⁻¹²	8.8 x 10⁻⁸	7.6 x 10⁻³ (0.91mSv)	2.77 (332mSv)
2.0 μ	4 x 10⁻¹²	3.5 x 10⁻¹¹	2.9 x 10⁻¹¹	3.6 x 10⁻⁷	0.031 (3.72mSv)	11.32 (1358mSv)
5.0 μ	6.5 x 10⁻¹¹	5.6 x 10⁻¹⁰	4.75 x 10⁻¹⁰	5.9 x 10⁻⁶	0.51 (60mSv)	186 (21900mSv)

Assumptions: Uranium Oxide (U238) is in the U₃O₈ form (density = 8.6); specific activity of U238 = 12.43 MBq/Kg; Alpha decay energy = 4.45MeV; Alpha range = 30 microns. Relative Biological Effectiveness factor for Alphas = 20 (from ICRP) has been used to convert dose in Grays to effective dose in Sieverts.

The table shows that for particles as small as 0.2 microns diameter, average annual alpha dose to the lymphatic tissue surrounding the particles is about the same as the total average natural background dose of 2mSv. (It is, of course, additional to NBR) For larger particles the local dose rapidly increases.

Particle sizes from 0.1 to 5 microns are frequent in the environment. The dangerous size range for genetic mutation is between 0.5 and 5 microns since "Second Event" processes will occur for particles of this size.