Table 5.3.1-11

Biological Process Strength Compared to EMF Interaction Strength

Interaction Process	Interaction Strength in Living System	Interaction Strength for Typical "large" EMF levels (*e.g.*, E = 1,000 V/m and M = 100 μT [or 1,000 mG])
Heating	basal metabolism ~ 100 watts	absorbed 60-Hz EMF energy = ~ 0.000 01 Watts (*i.e.*, 10 μwatts is 10,000,000 fold below basal metabolism)
Photon absorption	chemical bond energies of ~ 0.1 to 5 Ev	60 Hz EMF photons = ~0.000001 electron-volt (eV) (*i.e.*, EMF ~ 1 μeV, whereas X-Rays ~ 500 to 5,000 eV)
Force (electrical)	biological forces ~1 to 100 pN	Molecule with electric charge of ±100 = ~ 0.0002 pN (pN = 10^{-12} N = 0.000 000 000 001 Newton)
Force (magnetic)	biological forces ~1 to 100 pN	Twisting force on microscopic ferromagnetic particles, (acting like compass needles), ~2 pN, but EMF force alternates direction every 1/120th s, and averages to zero
Biochemistry	free-radical recombination lifetimes ~ 2 ns	Free-radical chemistry requires larger fields, and any effects occur over nanoseconds (ns) so that 60-Hz field with period of 17 ms appears same as static field

Table 5.3.1-12

Magnetic Fields for Most Lightly Loaded 33 kV Cable

Location	168 MW	454 MW
Sea Floor (0 ft)	1 Mg	3 mG
	(0.3 mG@10') a/	(0.7 mG@ 10') a/
+10 ft (3 meters)	0.2 mG	0.4 mG
+20 ft (6.1 meters)	<0.1 mG	0.2 mG
+30 ft (9.1 meters)	<0.1 mG	<0.1 mG

a/ Predicted field level on the sea floor 10 ft (3 meters) horizontally from the cable trench.