

(3) Rubber gloved, you are dribbling on an infinite court a basketball that is charged to 10 kV. How much energy is emitted as electromagnetic radiation, per bounce?

Solution: If the ball strikes the floor with velocity v and is compressed by a distance s during the bounce, the integral of (acceleration)² dt through the bounce is about v^3/s (actually $\pi v^3/2s$ if the bounce is harmonic). So the energy radiated is about $(v^3/s)(Q^2/c^3)$, where Q is the charge on the ball, in this case about 500 esu. I estimate $v = 500$ cm/s and $s = 2$ cm. The energy radiated is roughly 10^{-18} ergs per bounce. This only holds if the dimensions of the gymnasium are not less than 1000 miles!