**Measuring Radiation with a Geiger Counter CPM**

**What is CPM (also the ‘number’ used on the Radiation Network )?**

**CPM** (counts per minute) is a measure of radioactivity, a unit of measurement for a Geiger counter. Technically, “It is the number of atoms in a given quantity of radioactive material that are detected to have decayed in one minute.”

Most Geiger counters are calibrated to Cs137 (Cesium), a radioactive isotope.

1,200 CPM on the meter (for Cs137) is about 1 mR/hr (milliRad per hour).
120 CPM on the meter (for Cs137) is about 1 uSv/hr (microSievert per hour).

**How many CPM of radiation is bad?**

Answer: It depends on how long you are exposed at any given level. The Radiation Network website, for example, uses a threshold warning level of 100 CPM, mainly because it is unusual to observe levels of 100 or higher without something more going on in the area than just background level.

Having said that, how could one figure out the ‘badness’ of a given level? How bad is bad? All we need to do is put it in terms that makes sense.

First, we must understand a few radiation facts and numbers regarding dosage. There can be lots of conversions and it can be confusing, but by plodding through the math, you can determine a relationship of the Geiger counter numbers versus the risks to your health.

**Radiation Dosage**

Radiation *dosage* is a measure of risk – the biological harm that tissues receive in the body.

The unit of absorbed radiation dose is the sievert (Sv). Since one sievert is a large quantity, radiation doses are normally expressed in smaller units, milliSievert (mSv) or microSievert (µSv) which are one-thousandth or one-millionth of a sievert.

For example, one chest X-ray will give about 0.2 milliSievert (mSv) of radiation dose.

On average, our annual radiation exposure from all natural sources is about 300 milliRem, which is equivalent to 3 milliSieverts (3 mSv). Adding man-made sources (medical procedures, and others) the average annual U.S. radiation dose is about 600 milliRem, which is equivalent to 6 milliSieverts (6 mSv).

**Average annual human exposure to radiation (U.S.)**
600 milliRem (mRem)
6 milliSievert (mSv)

**Radiation dose for increase cancer risk of 1 in a 1,000**
1,250 milliRem (mRem)
12.5 milliSievert (mSv)

**Earliest onset of radiation sickness**
75,000 milliRem (mRem)
750 milliSievert (mSv)

**Onset of radiation poisoning**
300,000 milliRem (mRem)
3,000 milliSievert (mSv)

**Expected 50% death from radiation**
400,000 milliRem (mRem)
4,000 milliSievert (mSv)

**What do the Radiation Network CPM numbers mean with regards to health risk?**

With the examples of radiation dose listed above, we can correlate how long it would take to experience those effects based on a hypothetical **Geiger counter CPM number**.

So, let’s use the number 100, since this is the threshold that the **Radiation Network** website has chosen. The Cs137 calibration factor listed above (120 CPM) was converted to obtain the proper factored results listed below (0.83x). Higher CPM numbers are also listed for relevancy.

**Days compared with the avg. annual human exposure (U.S.)**
207 (at 100 CPM)
42 (at 500 CPM)
14 (at 1,500 CPM)
2 (at 10,000 CPM)

**Days to receive chronic dose for increase cancer risk of 1 in a 1,000**
432 (at 100 CPM)
86 (at 500 CPM)
28 (at 1,500 CPM)
4 (at 10,000 CPM)

**Days for earliest onset of radiation sickness**
25,937 (at 100 CPM)
5,187 (at 500 CPM)
1,729 (at 1,500 CPM)
259 (at 10,000 CPM)

**Conclusion:** The Geiger Counter CPM numbers that one may experience can be compared to the equivalent ‘what-IF’ scenarios listed above for potential health impact. *The lower the better. There are lots of theories and opinions regarding long-term effects, dosage vs. health, and the effects of various types of radioactive ionized particles making it into the food chain, etc… Do your due-diligence*

**Interesting fact:**
All food sources combined, expose a person to around 40 millirems per year on average.
Many foods are naturally radioactive, and bananas are particularly so, due to the radioactive potassium-40 they contain. The equivalent dose for 365 bananas (one per day for a year) is 3.6 millirems (36 μSv).

Other foods that have above-average levels are potatoes, kidney beans, nuts (especially brazil nuts), and sunflower seeds.