

Activity and Skin Dose Calculator Software

Assists radiation protection professionals with characterization and remediation efforts when dealing with sources of unknown radioactive contamination

The Activity Calculator software greatly assists in radiation protection and remediation efforts when dealing with unknown sources of radioactive contamination. The application eliminates the need to do lengthy calculations when determining the absolute activity of multiple radionuclides present in a source of contamination.

The Activity Calculator is a Windows based application which complements the commonly used 15 cm², thin window, GM pancake probe. When a source of contamination is discovered, a GM pancake probe is often used to measure the raw count rate at a given distance (typically near contact). A sample of the contamination is then sent to a gamma-ray

spectroscopy lab for analysis. Upon receiving the relative abundances of the radionuclides in the source, the Activity Calculator combines relative abundances and the measured raw count rate to determine the actual activity, in Bq, of each radionuclide. When the contaminated material is polyethylene (surrogate for tissue), the application estimates the skin dose rate.

The absolute activity of each radio-nuclide is determined by using extensive pre-calculated databases of photon and electron efficiencies for a wide range of GM probe counting geometries. These

efficiencies are calculated for a variety of distances, backing materials, and intervening materials.

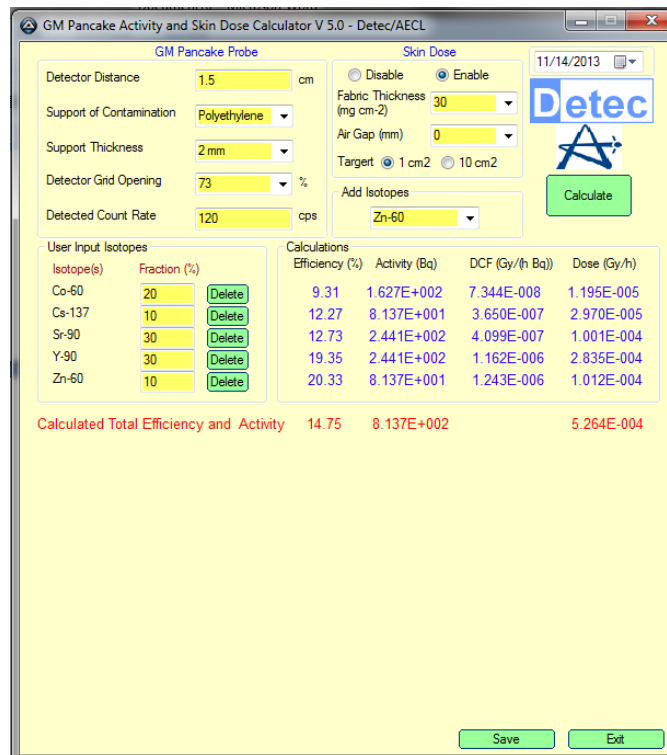


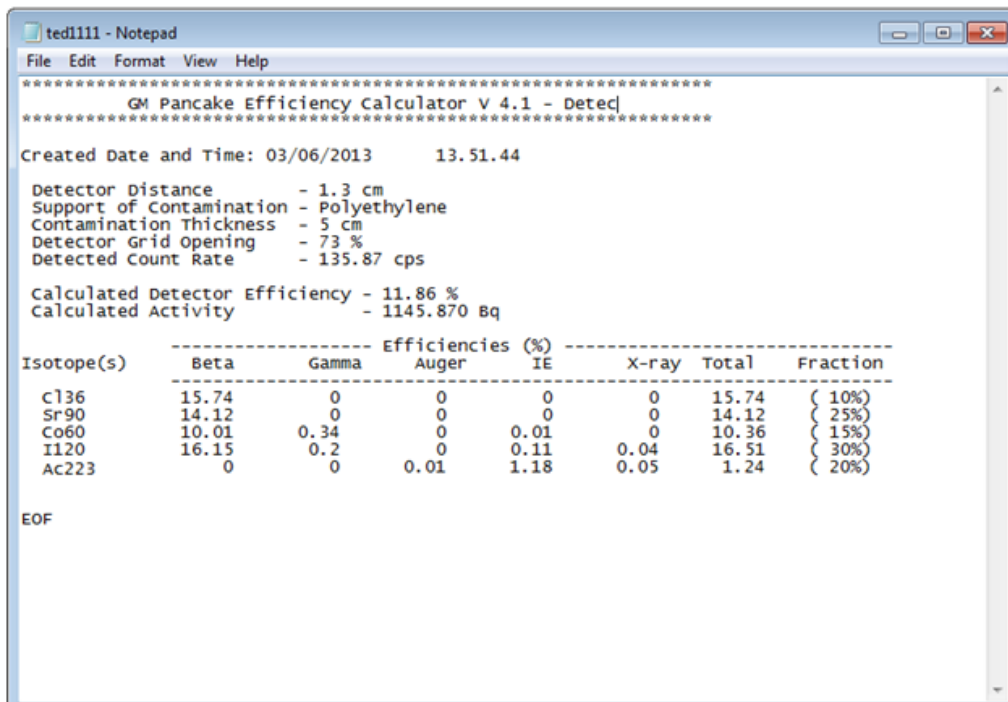
Figure 1: The GUI of the Activity Calculator software. Top left panel contains GM probe inputs. Located in the top right panel is the radionuclide library. Bottom left panel contains the percent fractions of radionuclides in contamination. The bottom right panel shows the resulting absolute activities and skin dose rates.

The software itself features a user friendly GUI, and a library of 1200+ radionuclides. It is able to calculate absolute activities for contaminations

containing mixtures of as many as 25 radionuclides.

Advantages of the Activity Calculator:

- Fast and accurate determination of absolute activity for mixed radionuclide sources of contamination
- User friendly GUI (see figure 1)
- Library containing 1252 radionuclides
- Variety of backing materials to reproduce counting measurement scenario (air, polyethylene, aluminum, and steel)
- Range of distances between source and probe (0.5 cm t 10 cm)



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File Edit Format View Help
*****
GM Pancake Efficiency Calculator V 4.1 - Detec[
*****
Created Date and Time: 03/06/2013      13.51.44
Detector Distance      - 1.3 cm
Support of Contamination - Polyethylene
Contamination Thickness - 5 cm
Detector Grid Opening  - 73 %
Detected Count Rate   - 135.87 cps

Calculated Detector Efficiency - 11.86 %
Calculated Activity      - 1145.870 Bq

Isotope(s)  ----- Efficiencies (%) -----
            Beta      Gamma      Auger      IE      X-ray      Total      Fraction
-----
C136        15.74         0         0         0         0         15.74      ( 10%)
Sr90        14.12         0         0         0         0         14.12      ( 25%)
Co60        10.01         0.34         0         0.01       0         10.36      ( 15%)
I120        16.15         0.2         0         0.11       0.04      16.51      ( 30%)
Ac223         0         0         0.01       1.18       0.05       1.24      ( 20%)

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Figure 2: Sample output file from the Activity Calculator. Output is saved into a text file for future reference. It contains all the input parameters and results.

The Activity Calculator software is developed and marketed by Detec under license from Atomic Energy of Canada Ltd.