

Rad Pro Calculator Version History

Version 1.901 (2-10-2006)

Added P-32 to decay calculation drop-down list, (2-10-2006).

Version 1.95 (2-11-2006)

Added an inverse square law calculations tab to the desktop version for students, previously only available on the on-line version.

Upgraded the help file on the desktop version to reflect all changes since 2004.

Many minor changes to the GUI, appearance and functionality.

Version 2.00 (5-7-2006)

Whole number version major upgrade. Upgraded to the .NET Framework 2.0 which gives the user controls the XP look when used with Windows XP and Windows Server 2003 (controls light up on mouse over, rounded buttons, etc.). Added shielding to the dose-rate activity tab. Changed the dose-rate calculations from 6CEN to fluence rate equations for more accuracy, especially for low energy (Am-241, Pb-210) and high energy (Co-60, N-16) isotopes. Added I-125 to the decay and dose-rate tabs. Many GUI and code tweaks.

Version 2.01 (5-10-2006)

Several bug fixes. The output format option was broken. On the U - Pu grams tab, uranium drop down list was empty when first opened. A few minor tweaks and minor bug fixes.

Version 2.10 (5-10-2006)

Major additions. The gamma dose-rate calculations were enhanced by adding attenuation due to air between the source and the detector. The shielding calculations may now be performed backwards, i.e select an isotope and a shield material, enter a starting dose-rate and a desired dose-rate and calculate the shielding thickness required. Beta dose-rate to activity and vice-versa were added. The calculators were sub-grouped under sub-tabs for like equations for future growth (beta dose-rate, gamma dose-rate and inverse square under one sub-group and conversions under another). Many GUI and code tweaks.

Version 2.11 (6-3-2006)

Fixed a bug issue where people with European regional Windows settings could not use commas and half-lives always used a decimal point instead of a decimal comma for European settings.

Version 2.12 (6-4-2006)

Fixed a bug issue involving a label not changing to "Calculated Thickness" on the gamma tab, when the user selects the "Calculate Shielding Thickness" option.

Version 2.13 (6-5-2006)

Changed the gamma calculations page to make the answer disappear when a change is made, to remind the user to hit the "Calculate" button again.

Version 2.14 (6-14-2006)

Fixed a bug where the "Select Time Units" selection group was not appearing when calculating the half-life and disappeared when it should not. Upgraded the install package to install version 3.1 of the MSI installer. I had some failures trying to install on Windows 98 and Windows NT legacy machines.

Version 2.15 (7-16-2006)

Added F-18 (FDG), Ag-108m, U-232 and 80 isotopes common to nuclear medicine (medical diagnostic and treatment) to the decay page. Added F-18 (FDG), Ag-108m, U-232, U-238 and 19 other medical isotopes to the gamma page.

Version 2.15.1 (7-17-2006)

Minor bug fixes. Sm-145 appeared twice on the list, N-13 was listed as N-11 and half-life did not change on for Kr-81m on the decay tab. Fixed dynamic labeling bugs on the gamma tab.

Version 2.30 (9-4-2006)

Major upgrade. Combined the Uranium Enrichment Calculator with Rad Pro Calculator. Now two great software packages function as one. Also added Bremsstrahlung calculations for beta emitters. Two shields may be added, one for beta shielding and one for shielding the bremsstrahlung x-rays produced by interaction with the beta shield.

On the decay tab, changed the isotope selection from sort by atomic number and weight to sort elements by alphabetical order.

Version 2.31 (10-19-2006)

Minor upgrade. Added I-125 to the decay and gamma calculations. Added website and email links to the "About Rad Pro Calculator" form.

Version 2.40 (11-19-2006)

Major upgrade. Added X-ray device calculator. Includes empirical data from the British standard, BS 4094-2:1971 and the ability to enter known tube output. The same shielding routine used for the popular gamma calculator is a part of the calculator.

Version 2.41 (12-21-2006)

Minor upgrade. Fixed decay calculator bug where element drop down list did not disappear when switching to half-life mode. Changed icon from yellow and black to yellow and magenta trefoil.

Version 2.42 (12-21-2006)

Medium upgrade. Fixed x-ray calculator bug where with shielding, 160kV gave the user a higher dose-rate than 200 kV or 160 kV, etc.

Version 2.45 (1-11-2007)

Minor upgrade. Fixed x-ray calculator shielding algorithm error.

Version 2.46 (1-20-2007)

Minor upgrade. Tweaked the x-ray shielding code for energies called for attenuation coefficients and buildup factors. Based on real life measurements, the x-ray shielding calculations were off by 100% (lower energies) to 800% (higher energies) before. Now they are within 20% to 30%.

Version 2.50 (2-25-2007)

Major upgrade. Added ALARA calculator. It includes the best of the gamma calculator, including shielding, and the Inverse Square Law calculator with the addition of dose limits and stay times. This includes the most common time, distance and shielding calculations done by ALARA engineers and emergency response personnel.

Added Cl-36, Ba-133 and Zr-89 to the decay calculator. Minor code fixes, including the Rb-83 gamma bug.

Version 2.60 (3-12-2007)

Major upgrade. Added skins to give the software a more modern appearance. Skins change the way the form, buttons and other controls appear. Several of the skins have Windows Vista style semi transparent borders. The user has a choice of 8 different skins or no skin at all.

Wrote a more advanced shielding algorithm for the ALARA calculator. The ALARA shielding numbers now exactly match the gamma calculator numbers.

Added Y-88, Zr-89 and I-124 to the gamma and ALARA calculators.

Version 2.61 (3-13-2007)

Minor upgrade. Some computers needed extra library files to make version 2.60 work properly because of the skins addition. Reconfigured the install file to include these libraries.

Version 2.61.1 (3-16-2007)

Minor upgrade. Reconfigured the install file to make the software Windows 2000 compatible again.

Version 2.62 (3-20-2007)

Minor upgrade. Fixed bug where actinium isotopes were listed twice in the decay calculator upon program startup. Fixed install bug where text for disclaimer and references was left out and error occurred when trying to open that menu item.

Version 2.63 (5-1-2007)

Minor upgrade. Added new skins, including Vista style and 5 skins exclusively for Windows 2000 users. Changed default skin.

Version 2.64 (5-2-2007)

Minor upgrade. Updated references to include Daniel Gollnick's book and the web page for fluence rate equations. Added the shielding and buildup white paper to the "Help" menu.

Version 2.65 (5-6-2007)

Minor upgrade. Added Pa-233 to the Decay, Gamma and ALARA calculators.

Version 2.70 (5-20-2007)

Major upgrade. Added two new calculators that solve equations for minimum detectable activity (MDA), more recently termed minimum detectable concentration or minimum detectable contamination (MDC). One calculator is for scalers, counters and static friskers in the timed count mode. The other is for scan surveys with friskers in the analog count rate mode. The scanner MDC calculator takes into account scan speed so that a faster scan produces a higher MDC.

Version 2.71 (6-21-2007)

Minor upgrade. Upgraded with newly released skin library file. No code or functional changes.

Version 3.00 (7-29-2007)

Whole number version major upgrade. Added Microsoft Excel output to the Decay, Gamma, Beta and Bremsstrahlung calculators. This ability allows multiple calculations to be saved, printed or copied and pasted into a database, Word document or Power Point presentation. A brand new, state of the art, up to date help file was written which has replaced the old, archaic one. Upgraded the output display format option. Now, instead of scientific notation always being rounded to two decimals, the user has the choice between full number or two number scientific notation (i.e. 2.7872376E-009 or 2.79E-009). Many GUI and code tweaks and several minor bug fixes. Upgraded with newly released skin library file.

Version 3.01 (8-6-2007)

Minor upgrade. Deleted use of all energies below 18 keV in gamma fluence rate equations. Deleted the energies from both the Gamma activity \leftrightarrow dose-rate

calculator and the ALARA calculator. Chart below shows which isotopes were affected and by how much.

mR/hr @ 1 foot for 1 mCi			mR/hr @ 40 feet for 10 Ci		
Isotope	Old	New	Isotope	Old	New
Co-57	0.99	0.53	Co-57	3.37	3.16
Zn-65	7.54	3.33	Zn-65	19.95	19.95
Pb-210	1.98	0.02	Pb-210	0.13	0.11
Pa-233	1.6	1.23	Pa-233	7.88	7.37
U-238	6.29	5.72	U-238	34.27	34.22
Am-241	1.61	0.18	Am-241	0.56	0.99
Cm-243	1.72	0.65	Cm-243	4.33	3.93

Version 3.02 (9-6-2007)

Minor upgrade. Fixed a reported bug on the scan MDC calculator. The calculator was not converting Bq/cm², therefore, even if Bq/cm² was selected, the results were being reported in dpm/100cm². Created a brand new install package that is more Windows Vista friendly. There are no more "you don't have administrative rights" errors when you are indeed logged on as administrator. This was a Windows Vista bug. To accommodate Vista users, XP users now must be logged in as a machine administrator to install the software. We regret having to make this choice.

Version 3.03 (9-7-2007)

Minor upgrade. A label now appears on the gamma calculator when Ra-226 or U-238 are selected to remind the user that they include gamma energies from daughter isotopes. On the Scaler MDC calculator, if type of instrument frisker was selected, units of mass and volume such as g, cc and L were still choices which did not make sense for a surface contamination instrument. That bug was fixed.

Version 3.04 (1-17-2008)

Minor upgrade. Added Pd-103 and Cs-131 to the gamma dose-rate-activity calculator and the ALARA calculator at the request of an oncologist. These are two either new or up and coming isotopes used therapeutically in brachytherapy seeds.

Version 3.05 (3-08-2008)

Medium upgrade. Fixed a bug in the beta dose-rate calculator that affected the output for multi-energy beta emitters when using the fluence rate option. Isotopes affected were Co-60, Y-90, SrY-90 and Cs-137. Turned on the Windows 2000 skins for Windows XP and Vista users.

Version 3.06 (3-14-2008)

Minor Upgrade. Changed the equilibrium status for SrY-90 in the beta calculator. Now if you type in 10 mSv of SrY-90, it calculates with 10 mCi of Sr-90 and 10 mCi of Y-90 instead of 5 of each. This was taken in response to user poll responses regarding what was expected from that calculation. Added a pop up label to inform users of what they are calculating.

Added a nice new feature. When you exit the program, it now saves your skin choice and your number formatting choice. When you start the program the next time, it opens up with your last choices of those settings.

Version 3.07 (4-09-2008)

Very Minor Upgrade. Added four new cool skins.

Version 3.08 (4-23-2008)

Minor Upgrade. Fixed a bug in the Decay calculator. On Thallium-201, the decay time displayed as 72.91 Hourss. Since part of the formula choice is based on the time label, the extra s in Hourss made the calculation act erratically. Sometimes it would use the label from the last isotope used (Days, Weeks, Years) and sometimes it did not know what to use so the user got a divide by zero error (overflow or NaN for not a number). The label was corrected to read Hours and now TI-201 works just fine. Note that only TI-201 was affected by this bug.

Version 3.10 (6-29-2008)

Major Upgrade. Added a timed decay calculator. This is useful for calculating the date that a drum of short lived waste reaches non-radioactive status, when sources reach exempt activity levels and when activated concrete is less than soil release limits, as well as other calculations. Most other calculators of this type only give you the number of days, years, etc. it takes for the isotope to reach the desired level. This new Rad Pro Calculator also gives you the calendar date that it reaches that activity.

Version 3.11 (9-14-2008)

Minor Upgrade. Fixed the Windows Vista issue that caused errors upon closing the program when logged in as a non-administrative user.

This version also marked the introduction of the first version to work with 64 bit operating systems (O/S). The 64 bit version by necessity had to be stripped down a little. The skins come from a 3rd party vendor and their library file does not work with 64 bit O/S. There is a bug in the 64 bit Microsoft O/S that everyone knows about in the developer community. Any print from the screen does not work, no matter what a developer programs in. Because both of these issues were beyond the reach of Rad Pro Calculator development, the 64 bit version has no skins and has no print buttons. The most popular calculators, however, have Excel output, which can be printed. That functions fine in 64 bit.

Version 3.20 (9-22-2008)

Medium Upgrade. There was a known difference between numbers produced between the fluence-rate method of beta exposure calculation and the extrapolation table method. Not having enough information to decide which was more accurate, we gave the user both methods and let them decide. We were recently contacted by a noted US Health Physicist who asked about the difference. After providing him with all of the information for both methods, he informed us that there was a flaw in the fluence-rate method, even though it came from a well respected textbook. That was all of the information that we needed to know that the extrapolation table is the more accurate method. In this version, the fluence-rate method option was deleted.

Although, all you have to do on previous versions is select the extrapolation table option, we recommend upgrading to this version so that you do not mistakenly use the default fluence-rate method in future calculations.

This update was applied to both 32 bit and 64 bit desktop versions, as well as the online version.

Version 3.21 (10-01-2008)

Very Minor Upgrade. Added labels to the appropriate calculators to designate that the calculations are for point sources.

Version 3.22 (10-01-2008)

Minor Upgrade. Turned some of the combo boxes into drop down lists. If a user tried to type in his own filter thickness on the x-ray calculator, instead of selecting one from the list, it crashed the program.

Version 3.23 (12-11-2008)

Minor Upgrade. Fixed a bug in the buildup factor subroutine. It was returning a slightly higher value than intended. This bug was present in the Gamma, X-ray and ALARA calculators. It became obvious when one of the Rad Pro Calculator users was doing X-ray calculations with a very thin layer of iron shielding. The X-ray calculator said that the shielded exposure-rate was more than the unshielded exposure-rate. All electromagnetic exposure-rate calculations now produce shielded numbers that are from 1% to 16% lower than before, if you use the buildup factor. The X-ray calculator and ALARA calculators always use the buildup factor. In the Gamma calculator, you have a choice whether to use it or not. This is mostly for the Rad Pro student's sake, to test μ versus μ_{en} calculations. Users in the field should in general use the buildup factor for the Gamma calculator.

This update affects all versions except the Smartphone, which does not do electromagnetic calculations.

Version 3.24 (5-09-2009)

Minor Upgrade. Fixed a bug in the x-ray device dose-rate tab. There was a typo in the code that interpolates the values from the British Standards graph. It was not noticeable unless you made subtle changes in the voltage and compared the results. This update affects the online web version, desktop and 64 bit desktop versions.

Version 3.25 (5-10-2009)

Minor Upgrade. Added Ra-223 to the gamma calculator.
This update affects the online web version, desktop version, 64 bit desktop version and Pocket PC PDA version.

Version 3.26 (5-24-2009)

Minor Upgrade. Updated the energy spectrum for Mo-99 on the gamma and ALARA calculators.