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The Effects of Propagated Source Uncertainty

If a fractional uncertainty is assigned to a calibration source's activity it will be propagated in the total efficiency uncertainty determination using the formula:

$$\sigma_{Eff} = Eff\sqrt{\left(\frac{\sigma_x}{x}\right)^2 + (F_s)^2}$$

In this formula (F_s) represents the fractional error assigned to the calibration source. The first term is the fractional counting error for a source count where *x* is the mean of the gross count results. For a single count this simplifies to:

$$\sigma_{Eff} = Eff\sqrt{\frac{1}{X} + (F_s)^2}$$

For example if a single source count of 10,000 counts yields a counting efficiency of 30%, the single deviation uncertainty is ±0.30% given that no fractional uncertainty is assigned to the source activity. If a fractional uncertainty of 0.01 is assigned to the source's activity the propagated uncertainty becomes ±0.424%.