

- **eqwidth: determine equivalent width**

Determine the equivalent width of a model component.

Syntax: **eqwidth** [[RANGE <frac range>] <[model name:]model component number>] [err <number> <level> | noerr]

The command calculates the integrated photon flux produced by an additive model component (combined with its multiplicative and/or convolution pre-factors) (FLUX), the location of the peak of the photon spectrum (E), and the flux (photons per keV) at that energy of the continuum (CONTIN). The equivalent width is then defined as {EW = FLUX / CONTIN} in units of keV. [New for version 12: the continuum is defined to be the contribution from all other components of the model.](#)

There are certain models with a lot of structure where, were they the continuum, it might be inappropriate to estimate the continuum flux at a single energy. The continuum model is integrated (from $E(1-\text{<frac range>})$ to $E(1+\text{<frac range>})$). The initial value of <frac range> is 0.05 and it can be changed using the RANGE keyword.

The err/noerr switch sets whether errors will be estimated on the equivalent width. The error algorithm is to draw parameter values from the distribution and calculate an equivalent width. <number> of sets of parameter values will be drawn. The resulting equivalent widths are ordered and the central <level> percent selected to give the error range. The parameter values distribution is assumed to be a multivariate Gaussian centered on the best-fit parameters with sigmas from the covariance matrix. This is only an approximation in the case that fit statistic space is not quadratic.

Examples:

The current model is assumed to be $M_1(A_1+A_2+A_3+A_4+M_2(A_5))$, where the M_x models are multiplicative and the A_x models are additive.

```
XSPEC12> eqwidth 3
// Calculate the total flux of component  $M_1A_2$  (the third
// component of the model with its multiplicative pre-factor)
// and find its peak energy (E). The continuum flux is
// found by the integral flux of  $M_1(A_1+A_3+A_4+M_2(A_5))$ , using the
// range of 0.95E to 1.05E to estimate the flux.
XSPEC12> eqwidth range .1 3
// As before, but now the continuum is estimated from
// its behavior over the range 0.9E to 1.1E.
XSPEC12> eqwidth range 0 3
// Now the continuum at the single energy range (E)
// will be used.
XSPEC12> eqwidth range .05 2
// Now the component  $M_1A_1$  is used as the feature, and
//  $M_1(A_2+A_3+A_4+M_2(A_5))$  are used for the continuum. The range
// has been reset to the original value.
XSPEC12> eqwidth 1
// Illegal, as  $M_1$  is not an additive component.
```

