

- **plcabs: powerlaw observed through dense, cold matter**

This model describes X-ray transmission of an isotropic source of photons located at the center of a uniform, spherical distribution of matter, correctly taking into account Compton scattering. The model can be used for radial column densities up to  $5 \times 10^{24} \text{ cm}^{-2}$ . The valid energy range for which data can be modeled is between 10 and 18.5 keV, depending on the column density. Details of the physics of the model, the approximations used and further details on the regimes of validity can be found in Yaqoob (1997; ApJ, 479, 184). In this particular incarnation, the initial spectrum is a power law modified by a high-energy exponential cut-off above a certain threshold energy.

Also, to improve the speed, a FAST option is available in which a full integration over the input spectrum is replaced by a simple mean energy shift for each bin. This option is obtained by setting parameter 9 to a value of 1 or greater and cannot be made variable. Further, for single-scattering albedos less than ACRIT (*i.e.* par8) energy shifts are neglected altogether. The recommended value is ACRIT=0.1 which corresponds to about 4 keV for cosmic abundances and is more than adequate for ASCA data.

Note that for column densities in the range  $10^{23} - 10^{24} \text{ cm}^{-2}$ , the maximum number of scatterings which need be considered for convergence of the spectrum of better than 1% is between 1 and 5. For column densities as high as  $5 \times 10^{24} \text{ cm}^{-2}$ , the maximum number of scatterings which need be considered for the same level of convergence is 12. This parameter cannot be made variable.

par1	Column density in units $10^{22} \text{ cm}^{-2}$
par2	Maximum number of scatterings to consider.
par3	Iron abundance.
par4	Iron K edge energy.
par5	Power-law photon index.
par6	High-energy cut-off threshold energy.
par7	High-energy cut-off e-folding energy.
par8	Critical albedo for switching to elastic scattering.
par9	If par9 > 1, function uses mean energy shift, not integration.
par10	Source redshift, $z$
norm	Normalization factor