

- **xion: reflected spectrum of photo-ionized accretion disk/ring**

This model describes the reflected spectra of a photo-ionized accretion disk or a ring if one so chooses. The approach is similar to the one used for tables with stellar spectra. Namely, a large number of models are computed for a range of values of the spectral index, the incident X-ray flux, disk gravity, the thermal disk flux and iron abundance. Each model's output is an un-smearred reflected spectrum for 5 different inclination angles ranging from nearly pole-on to nearly face on, stored in a look-up table. The default geometry is that of a lamppost, with free parameters of the model being the height of the X-ray source above the disk, h_X , the dimensionless accretion rate through the disk, \dot{m} , the luminosity of the X-ray source, L_X , the inner and outer disk radii, and the spectral index. This defines the gravity parameter, the ratio of X-ray to thermal fluxes, etc., for each radius, which allows the use of a look-up table to approximate the reflected spectrum. This procedure is repeated for about 30 different radii. The total disk spectrum is then obtained by integrating over the disk surface, including relativistic smearing of the spectrum for a non-rotating black hole (e.g., Fabian 1989).

In addition, the geometry of a central sphere (with power-law optically thin emissivity inside it) plus an outer cold disk, and the geometry of magnetic flares are available (`par13 = 2` and `3`, respectively). One can also turn off relativistic smearing to see what the local disk spectrum looks like (`par12 = 2` in this case; otherwise leave it at `4`). In addition, `par11 = 1` produces reflected plus direct spectrum/direct; `par11 = 2` produces (incident + reflected)/incident [note that normalization of incident and direct are different because of solid angles covered by the disk; `2` should be used for magnetic flare model]; and `par11 = 3` produces reflected/incident. Abundance is controlled by `par9` and varies between 1 and 4 at the present. A much more complete description of the model will be presented in Nayakshin et al. 2001 (currently available at http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=2001ApJ...546..406N&db_key=AST&data_type=HTML&format=&high=4230b2429423803)

<code>par1</code>	height of the source above the disk (in Schwarzschild radii)
<code>par2</code>	ratio of the X-ray source luminosity to that of the disk
<code>par3</code>	accretion rate (in Eddington units)
<code>par4</code>	$\cos i$ the inclination angle (<code>1</code> = face-on)
<code>par5</code>	inner radius of the disk (in Schwarzschild radii)
<code>par6</code>	outer radius of the disk (in Schwarzschild radii)
<code>par7</code>	photon index of the source
<code>par8</code>	redshift z

par9 Fe abundance relative to Solar (which is defined as 3.16×10^{-5} by number relative to H)

par10 Exponential high energy cut-off energy for the source

1 \Rightarrow (reflected+direct)/direct

par11 2 \Rightarrow (reflected+incident)/incident

3 \Rightarrow reflected/incident

par12 2 \Rightarrow no relativistic smearing

4 \Rightarrow relativistic smearing

par13 1 \Rightarrow lamppost

2 \Rightarrow central hot sphere with outer cold disk

3 \Rightarrow magnetic flares above a cold disk

Note that setting par13 to 2 gives a central hot sphere with luminosity law $dL/dR = 4\pi R^2 R^{-10y}$. The inner radius of the sphere is 3 Schwarzschild radii and the outer radius is equal to par1. Only the case with $\text{par5} \geq \text{par1}$ has been tested so far.