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 AHELP for CIAO 3.4

## xstbgrain

Context: [sherpa](#)

*Jump to:* [Description](#) [Bugs](#) [See Also](#)

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### Synopsis

Calculates the absorption of X-rays by the ISM with variable hydrogen to H2 ratio and grain parameters. XSpec model.

### Description

The Tuebingen–Boulder ISM absorption model. This model calculates the cross–section for X–ray absorption by the ISM as the sum of the cross–sections for X–ray absorption due to the gas–phase ISM, the grain–phase ISM, and the molecules in the ISM. In the grain–phase ISM, the effect of shielding by the grains is accounted for, but is extremely small. In the molecular contribution to the ISM cross–section, only molecular hydrogen is considered. In the gas–phase ISM, the cross–section is the sum of the photoionization cross–sections of the different elements, weighted by abundance and taking into account depletion onto grains. In addition to the updates to the photoionization cross–sections, the gas–phase cross–section differs from previous values as a result of updates to the ISM abundances. Details of updates to the photoionization cross–sections as well as to abundances can be found in Wilms, Allen and McCray (2000, ApJ 542, 914). This model allows the user to vary the molecular hydrogen column and the grain distribution parameters.

#### xstbgrain Parameters

Number	Name	Description
1	nH	equivalent hydrogen column (in units of $10^{22}$ atoms/cm <sup>2</sup> )
2	h2	molecular hydrogen column (in units of $10^{22}$ atoms/cm <sup>2</sup> )
3	rho	grain density (in gm/cm <sup>3</sup> )
4	amin	grain minimum size (in microns)
5	amax	grain maximum size (in microns)
6	PL	power law index of grain sizes

This information is taken from the [XSpec User's Guide](#). Version 11.3.1 of the XSpec models is supplied with CIAO 3.2.

### Bugs

For a list of known bugs and issues with the XSPEC models, please visit the [XSPEC bugs page](#).

## See Also

### *sherpa*

[atten](#), [bbody](#), [bbodyfreq](#), [beta1d](#), [beta2d](#), [box1d](#), [box2d](#), [bpl1d](#), [const1d](#), [const2d](#), [cos](#), [delta1d](#), [delta2d](#), [dered](#), [devaucouleurs](#), [edge](#), [erf](#), [erfc](#), [farf](#), [farf2d](#), [fpsf](#), [fpsf1d](#), [frmf](#), [gauss1d](#), [gauss2d](#), [gridmodel](#), [hubble](#), [jdpileup](#), [linebroad](#), [lorentz1d](#), [lorentz2d](#), [models](#), [nbeta](#), [ngauss1d](#), [poisson](#), [polynom1d](#), [polynom2d](#), [powlaw1d](#), [ptsrc1d](#), [ptsrc2d](#), [rsp](#), [rsp2d](#), [schechter](#), [shexp](#), [shexp10](#), [shlog10](#), [shloge](#), [sin](#), [sqrt](#), [steph1d](#), [steplo1d](#), [tan](#), [tpsf](#), [tpsf1d](#), [usermodel](#), [xs](#), [xsabsori](#), [xsacisabs](#), [xsapec](#), [xsbapec](#), [xsbody](#), [xsbodyrad](#), [xsbexrav](#), [xsbexriv](#), [xsbknpower](#), [xsbmc](#), [xsbremss](#), [xsbvapec](#), [xsc6mekl](#), [xsc6pmekl](#), [xsc6pvmkl](#), [xsc6vmekl](#), [xscabs](#), [xscemekl](#), [xscevmecl](#), [xscflow](#), [xscmpbb](#), [xscmpls](#), [xscmpst](#), [xscmptt](#), [xsconstant](#), [xscutoffpl](#), [xscyclabs](#), [xsdisk](#), [xsdiskbb](#), [xsdiskline](#), [xsdiskm](#), [xsdisko](#), [xsdiskpn](#), [xsdust](#), [xsedge](#), [xsequil](#), [xsexpabs](#), [xsexpdec](#), [xsexpfac](#), [xsgabs](#), [xsgaussian](#), [xsgnei](#), [xsgrad](#), [xsgrbm](#), [xshighecut](#), [xshrefl](#), [xslaor](#), [xslorentz](#), [xsmeka](#), [xsmekal](#), [xsmkcflow](#), [xsnei](#), [xsnotch](#), [xsnpshock](#), [xsnsa](#), [xsnteea](#), [xspcfabs](#), [xspgpwrlw](#), [xspexrav](#), [xspexriv](#), [xsphabs](#), [xsplabs](#), [xsplcabs](#), [xspesm](#), [xspowerlaw](#), [xspshock](#), [xspwab](#), [xsraymond](#), [xsredden](#), [xsredge](#), [xsrefsch](#), [xssedov](#), [xssmedge](#), [xsspline](#), [xssrcut](#), [xssresc](#), [xssssice](#), [xsstep](#), [xstbabs](#), [xstbvarabs](#), [xsuvred](#), [xsvapec](#), [xsvarabs](#), [xsvbremss](#), [xsvequil](#), [xsvgnei](#), [xsvmcflow](#), [xsvmekal](#), [xsvmekal](#), [xsvnei](#), [xsvnpshock](#), [xsvphabs](#), [xsvphabs](#), [xsvraymond](#), [xsvsedov](#), [xswabs](#), [xswndabs](#), [xsxion](#), [xszbbody](#), [xszbremss](#), [xszedge](#), [xszauss](#), [xszhighect](#), [xszpcfabs](#), [xszphabs](#), [xszpowerlw](#), [xsztbabs](#), [xszvarabs](#), [xszvfeabs](#), [xszvphabs](#), [xszwabs](#), [xszwndabs](#)

### *slang*

[usermodel](#)

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URL:  
<http://cxc.harvard.edu/ciao3.4/xstbgrain.html>  
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