



AHELP for CIAO 3.4

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## Synopsis

Calculates the absorption of X-rays by the ISM, allowing user to vary all abundances, depletion factors, and grain properties. 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, the grain distribution parameters, and the abundances and grain depletions.

### xstbvarabs Parameters

Number	Name	Description
1	nH	equivalent hydrogen column (in units of $10^{22}$ atoms/cm <sup>2</sup> )
2–18	(element)	columns of He, C, N, O, Ne, Na, Mg, Al, Si, S, Cl, Ar, Ca, Cr, Fe, Co, Ni (in units of $10^{22}$ atoms/cm <sup>2</sup> )
19	H2	molecular hydrogen column (in units of $10^{22}$ atoms/cm <sup>2</sup> )
20	rho	grain density (in gm/cm <sup>3</sup> )
21	amin	grain minimum size (in microns)
22	amax	grain maximum size (in microns)
23	PL	power law index of grain sizes
24–41	(element)Dep	grain depletion fractions of He, C, N, O, Ne, Na, Mg, Al, Si, S, Cl, Ar, Ca, Cr, Fe, Co, Ni
42	Redshift	redshift, z

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](#), [xsbbody](#), [xsbbodyrad](#), [xsbexrav](#), [xsbexriv](#), [xsbknpower](#), [xsbmc](#), [xsbremss](#), [xsbvapec](#), [xsc6mekl](#), [xsc6pmekl](#), [xsc6pvmkl](#), [xsc6vmekl](#), [xscabs](#), [xscemekl](#), [xscvcmkl](#), [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](#), [xshighcut](#), [xshrefl](#), [xslaor](#), [xslorentz](#), [xsmeka](#), [xsmekal](#), [xsmkcfLOW](#), [xsnei](#), [xsnotch](#), [xsnpshock](#), [xsnsa](#), [xsnteea](#), [xspcfabs](#), [xspgpwrlw](#), [xspexrav](#), [xspexriv](#), [xspfabs](#), [xsplabs](#), [xspfcabs](#), [xsposm](#), [xspowerlaw](#), [xspshock](#), [xspwab](#), [xstraymond](#), [xsredder](#), [xsredge](#), [xsrefsch](#), [xssedov](#), [xssmedge](#), [xsspline](#), [xssrcut](#), [xssresc](#), [xssssice](#), [xsstep](#), [xstbabs](#), [xstbgrain](#), [xsuvred](#), [xsvapec](#), [xsvarabs](#), [xsvbremss](#), [xsvsequil](#), [xsvgnei](#), [xsvmcfLOW](#), [xsvmekal](#), [xsvmekal](#), [xsvnei](#), [xsvnpshock](#), [xsvphabs](#), [xsvpshock](#), [xsvraymond](#), [xsvsedov](#), [xswabs](#), [xswndabs](#), [xsxion](#), [xszbbody](#), [xszbremss](#), [xszedge](#), [xszgauss](#), [xszhigect](#), [xszpcfabs](#), [xszphabs](#), [xszpowerlw](#), [xsztbabs](#), [xszvarabs](#), [xszvfeabs](#), [xszvphabs](#), [xszwabs](#), [xszwndabs](#)

### *slang*

[usermodel](#)

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