Charge exchange for population modelling

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- Patterns of charge exchange lines in the visible
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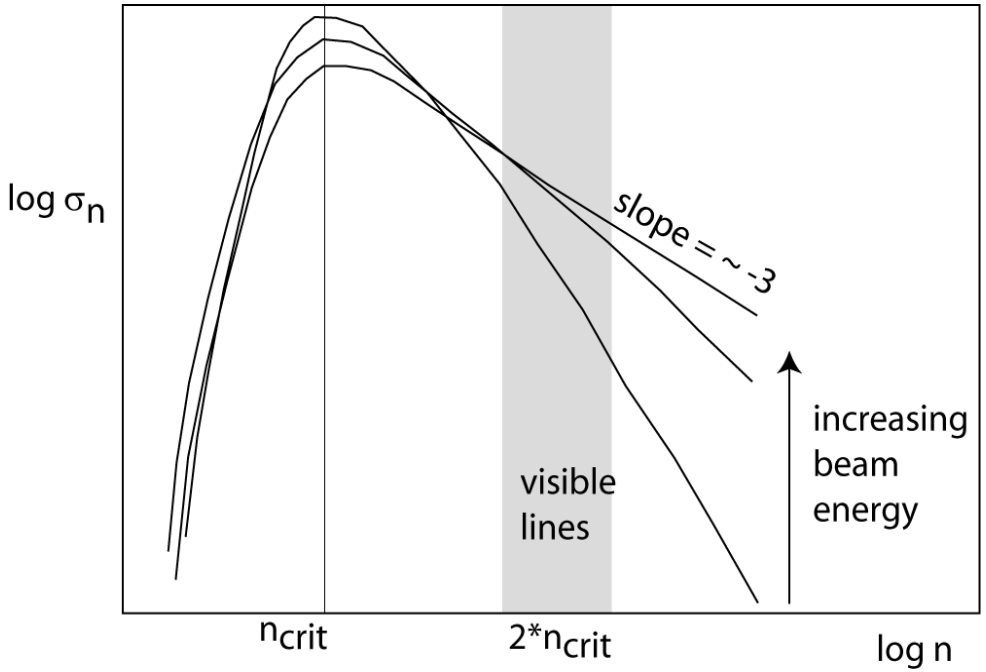
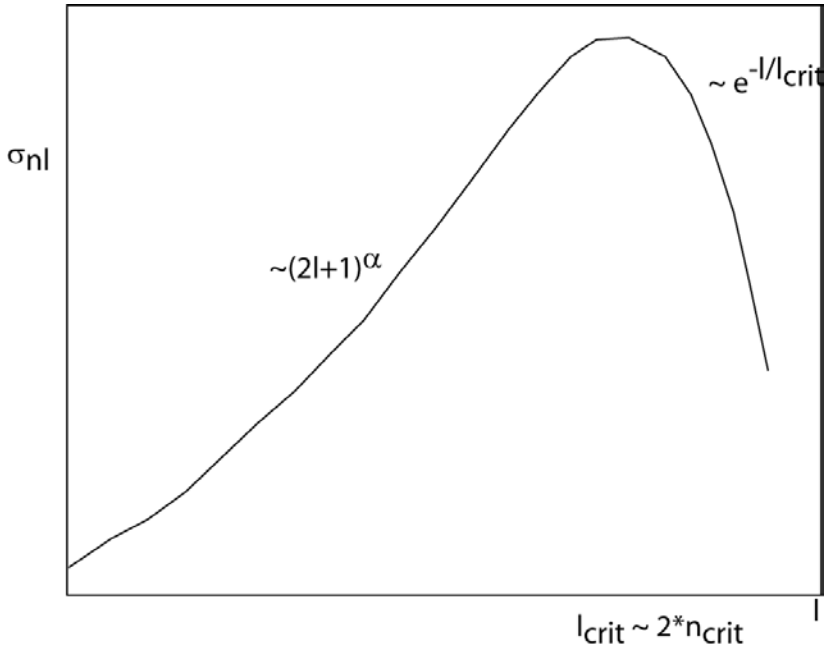
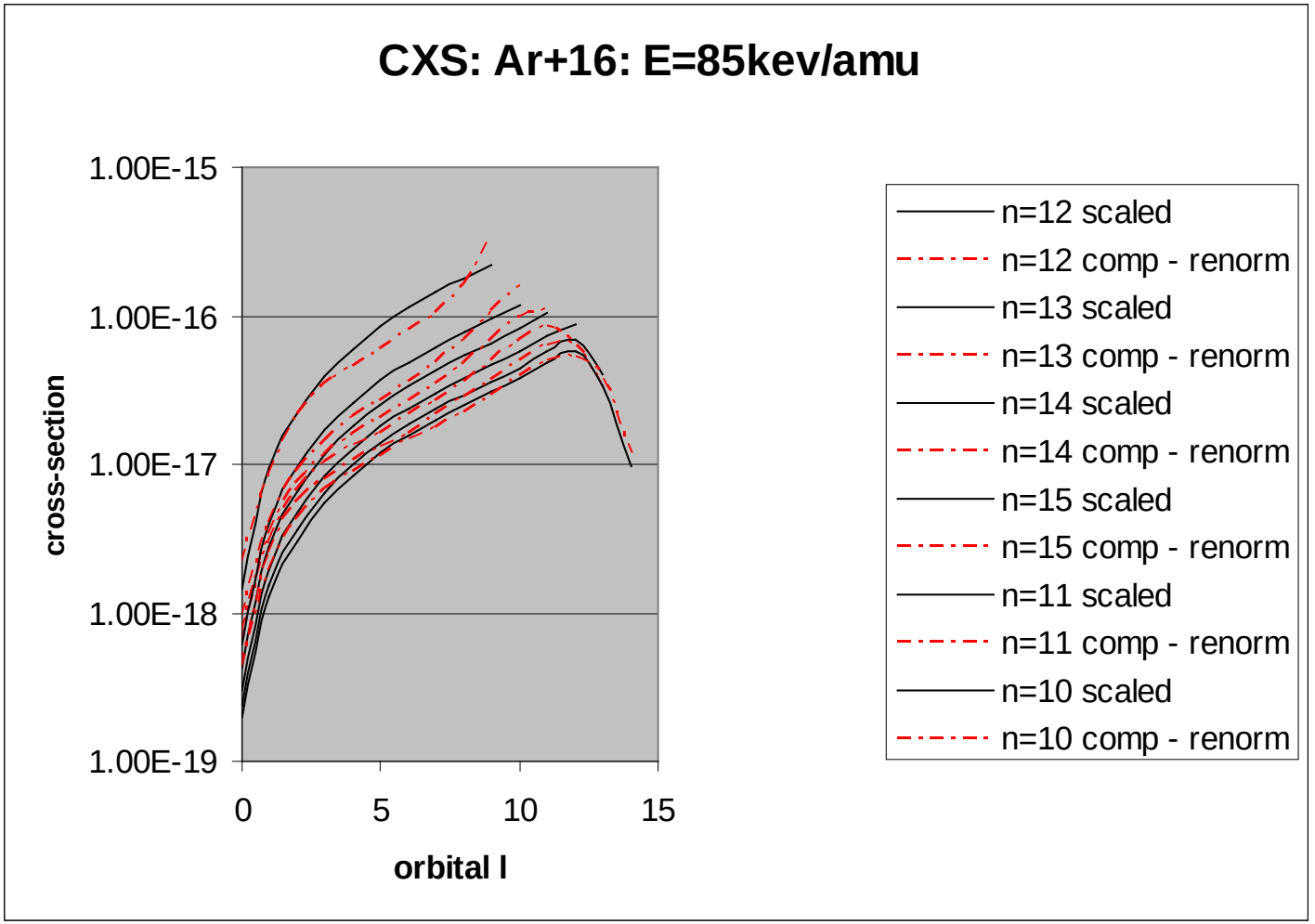
Characteristic behaviour of partial charge exchange cross-sections

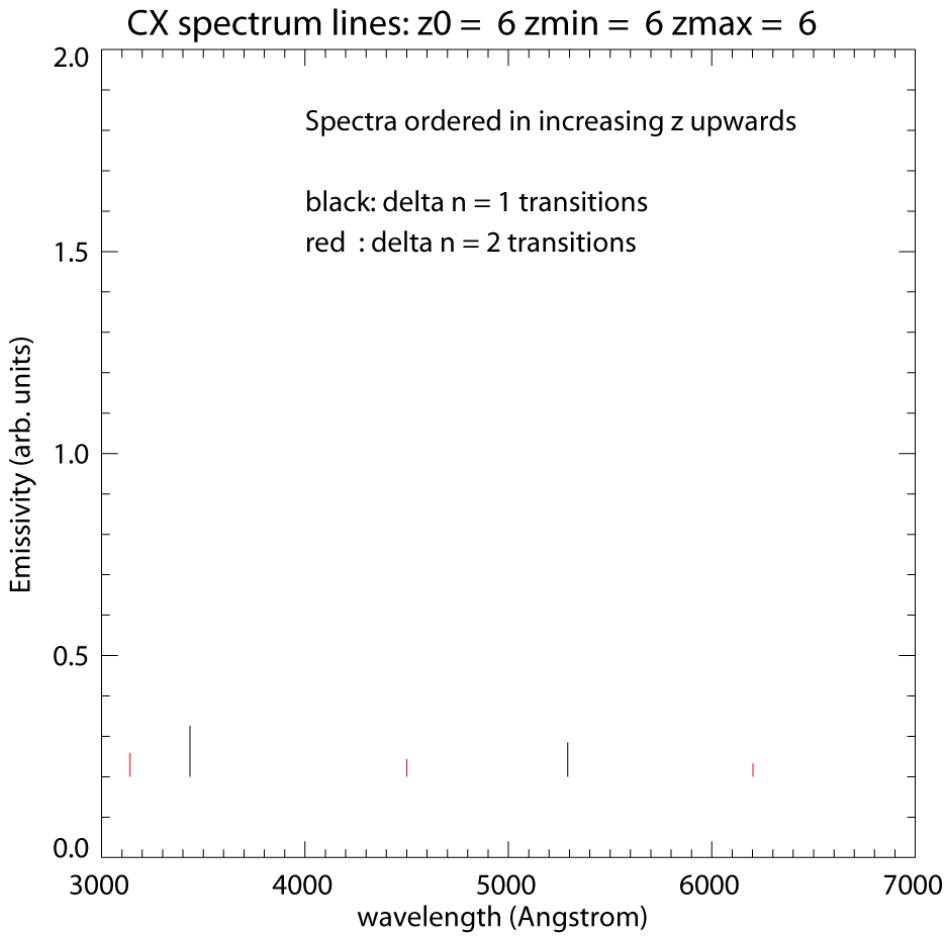


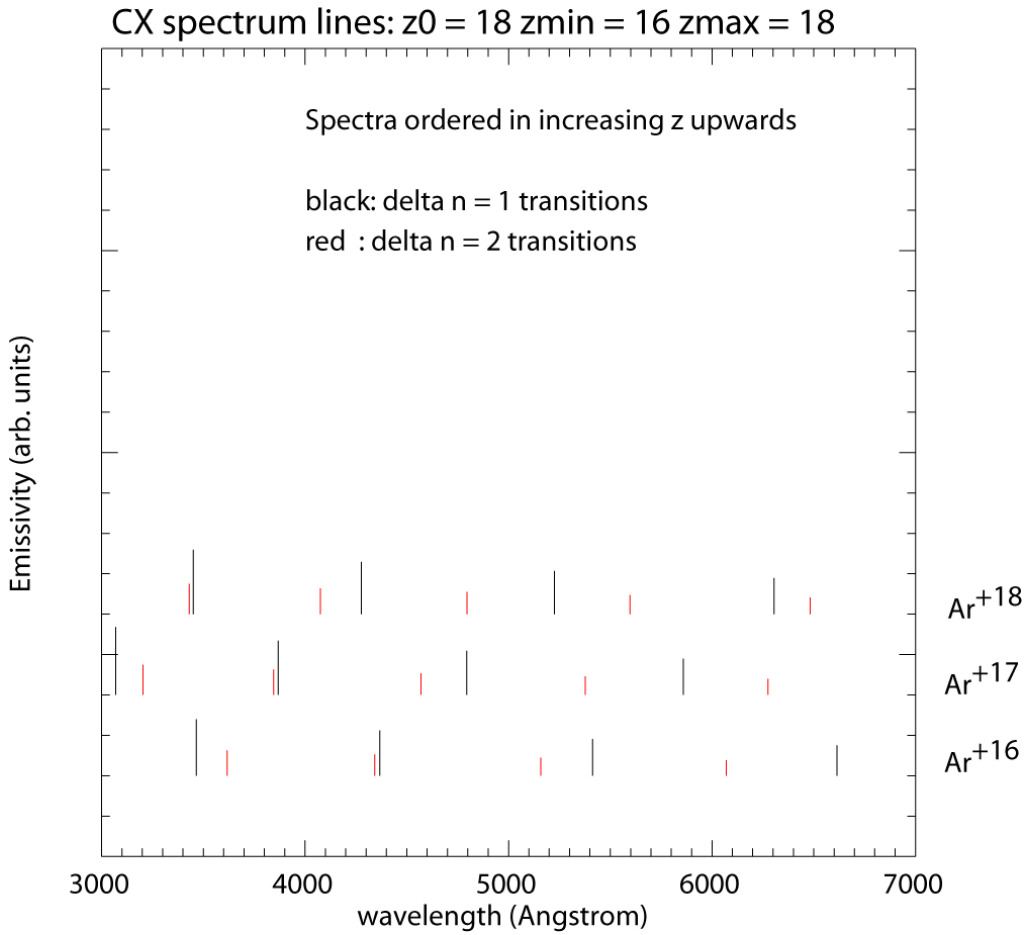


Comparison of l-subshell cross-sections with light element parametrisation

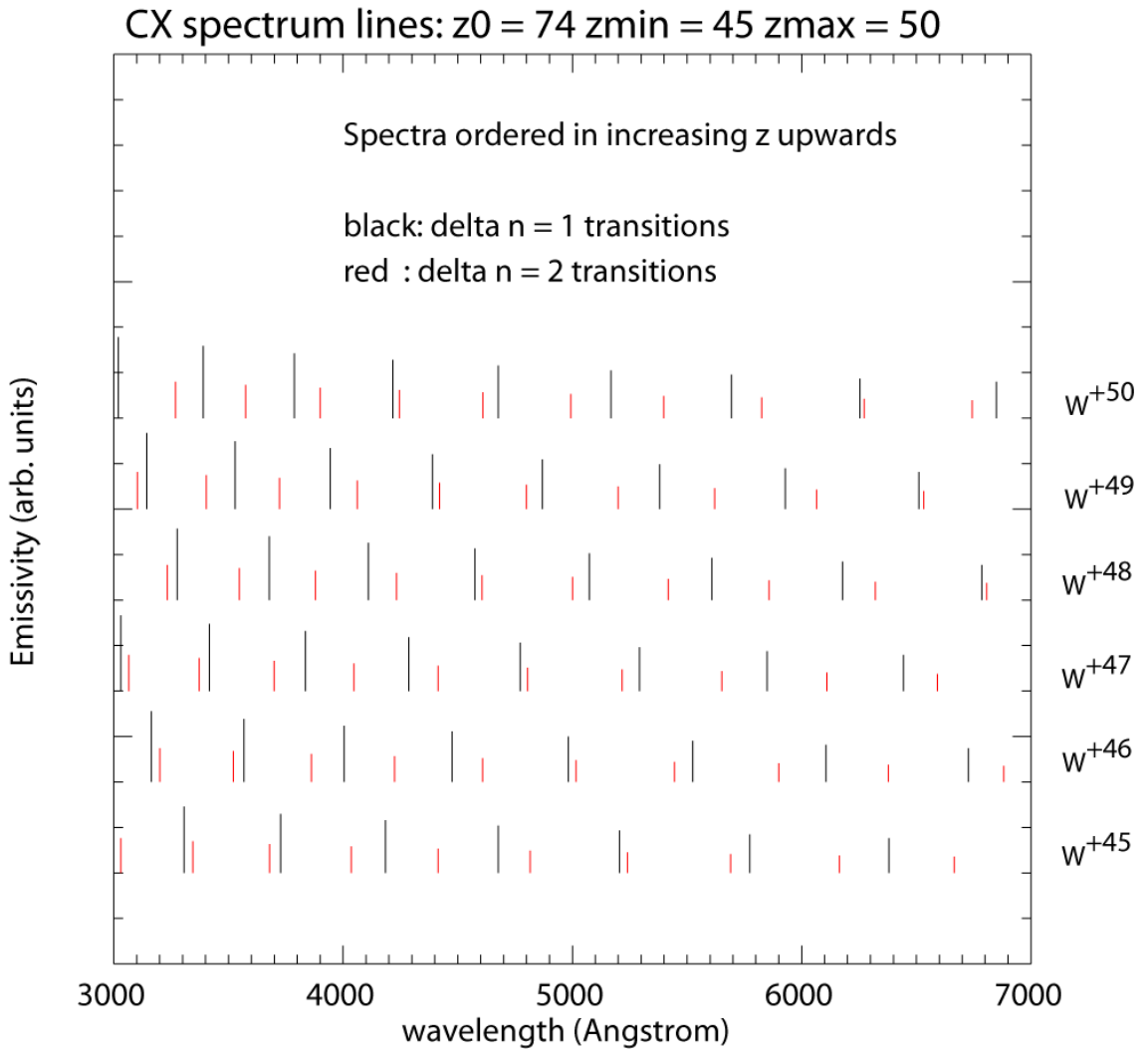


Patterns of CXS lines in the visible

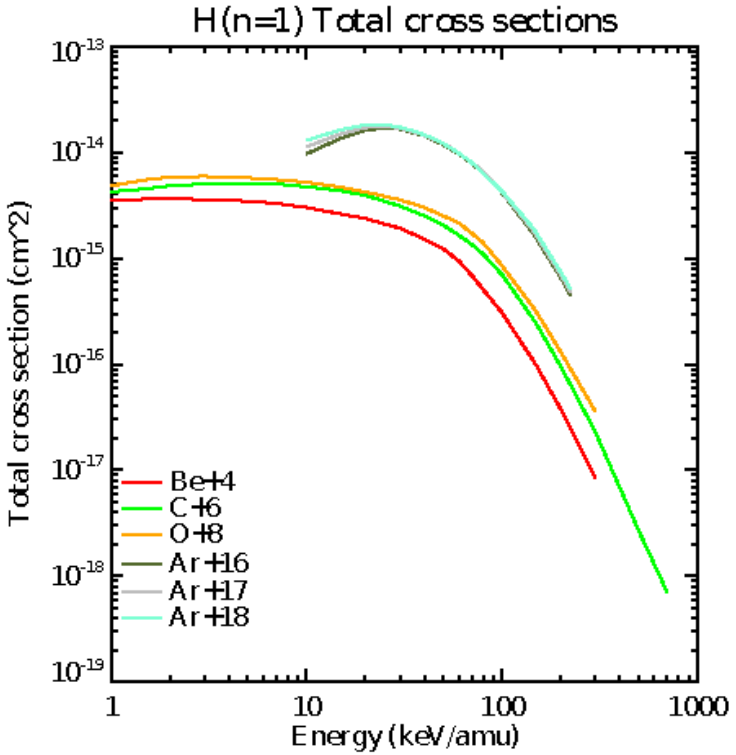


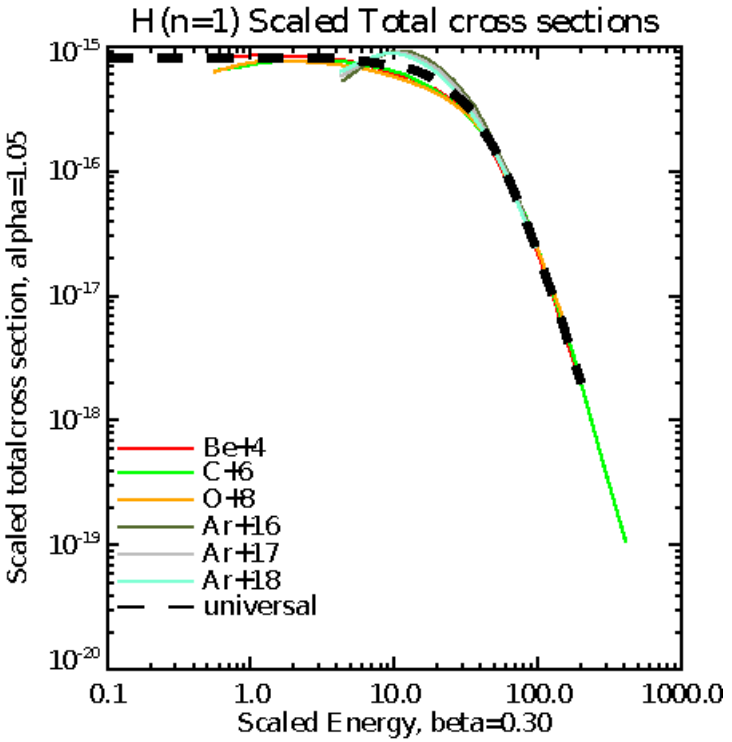


Patterns of CXS lines in the visible (contd)



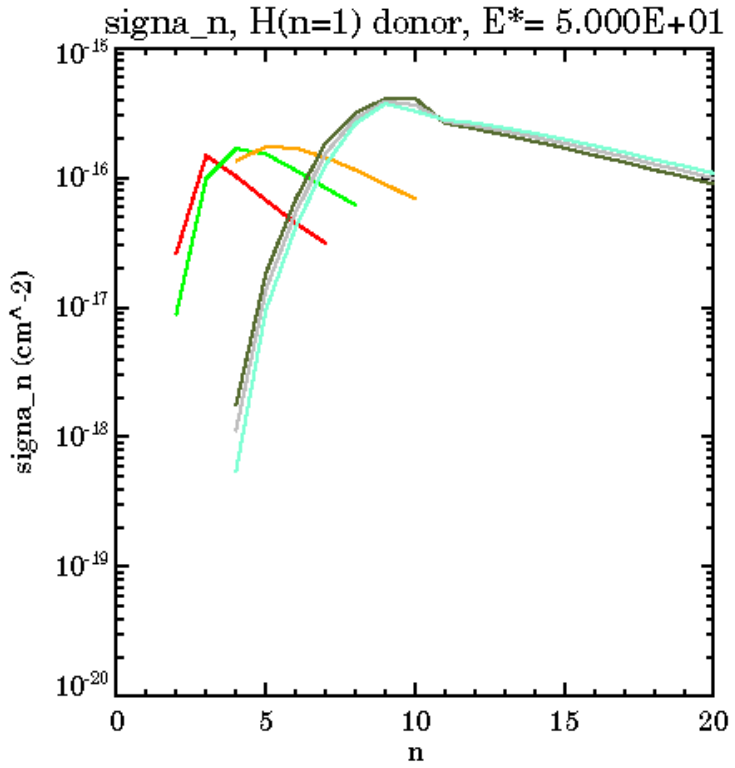
z_r-scaling of total charge exchange cross-sections for H(n=1) donor

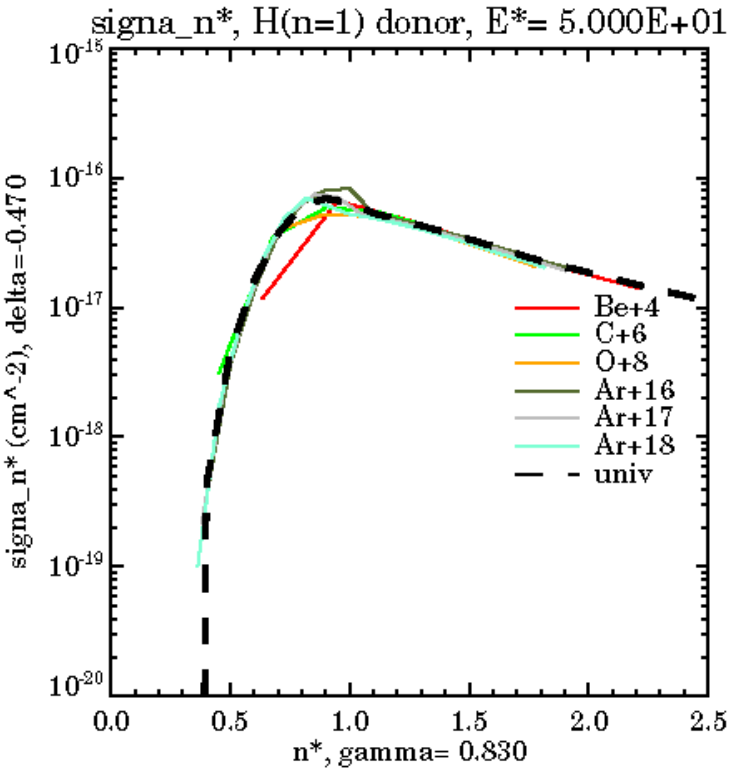




$$\sigma^*_{tot} = \sigma_{tot} z_r^{-\alpha} \qquad E^* = E z_r^{-\beta}$$

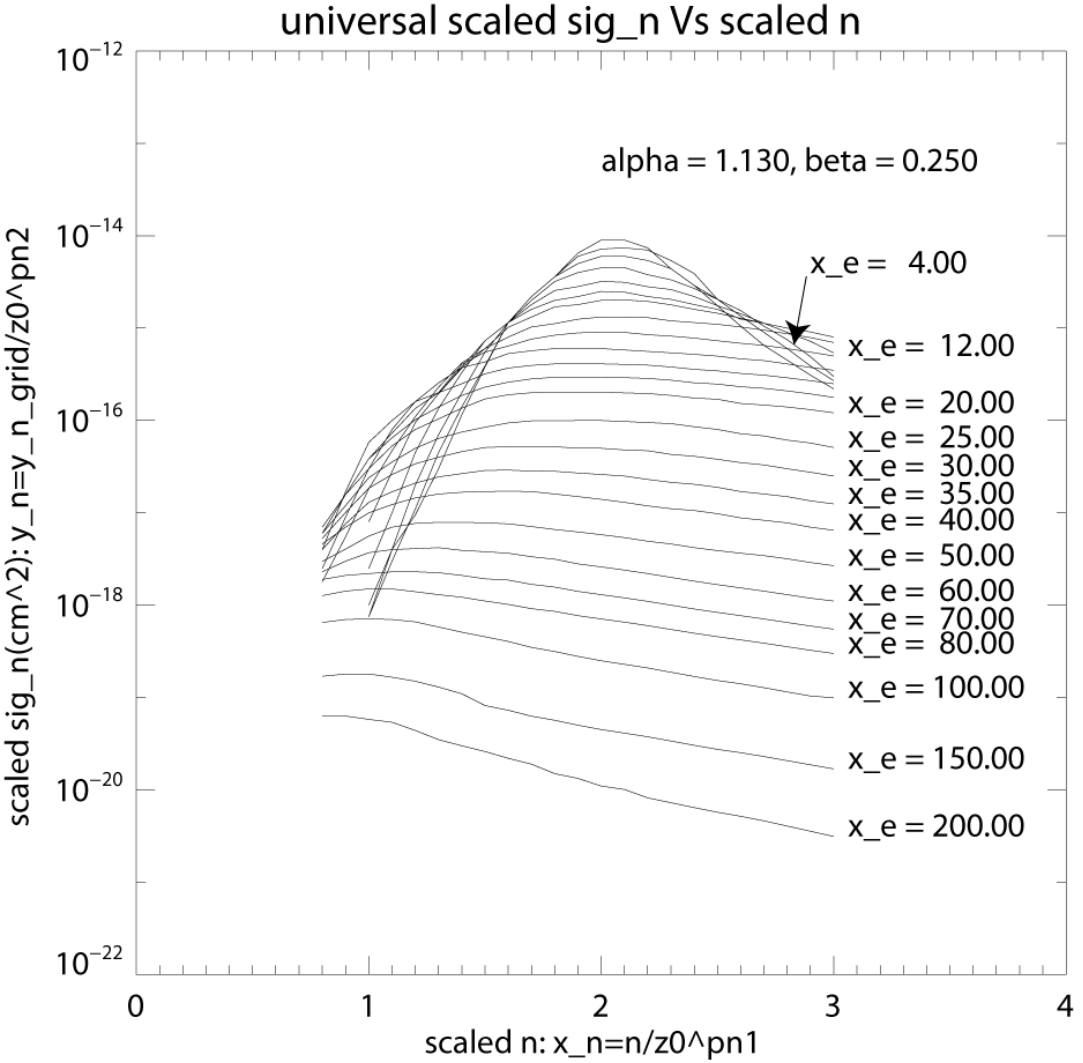
z_r-scaling of n-shell charge exchange cross-sections for H(n=1) donor





$$\sigma_n^* = \sigma_n z_r^{-\delta(E^*)} \qquad n^* = n z_r^{-\gamma(E^*)}$$

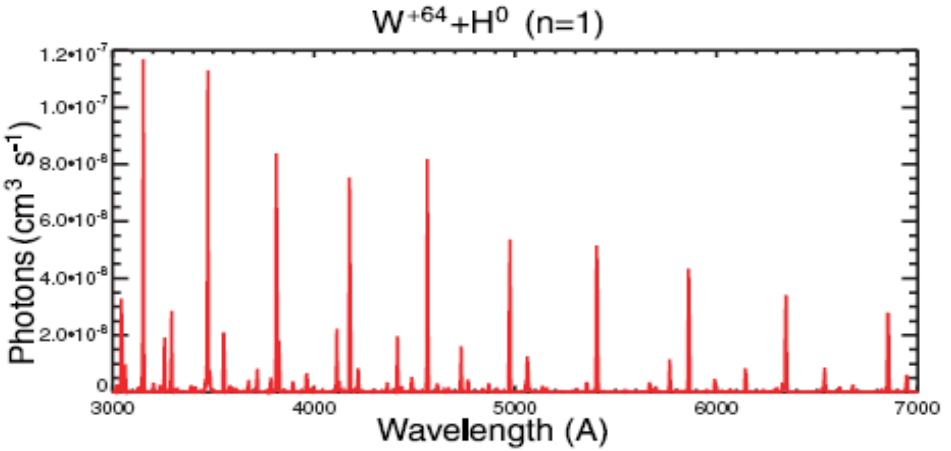
Universal scaled_sig Vs scaled_n for selected scaled E.

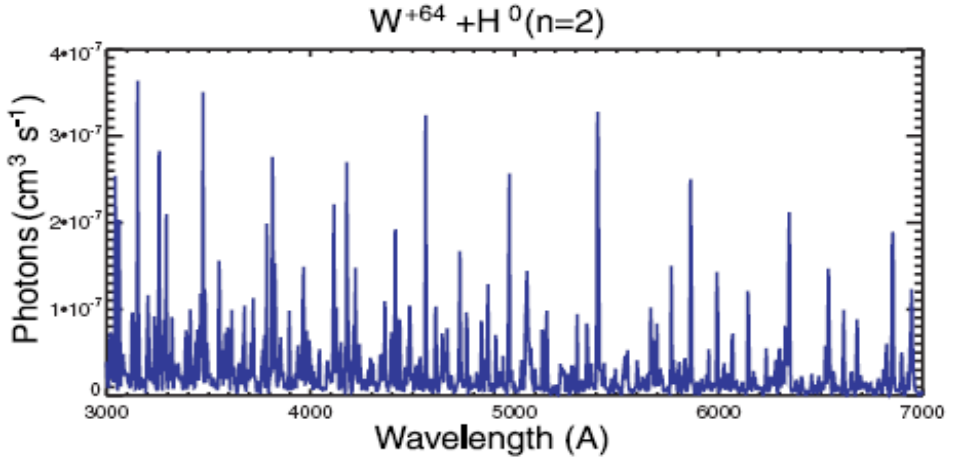


Extension of the CXS capabilities to heavier species

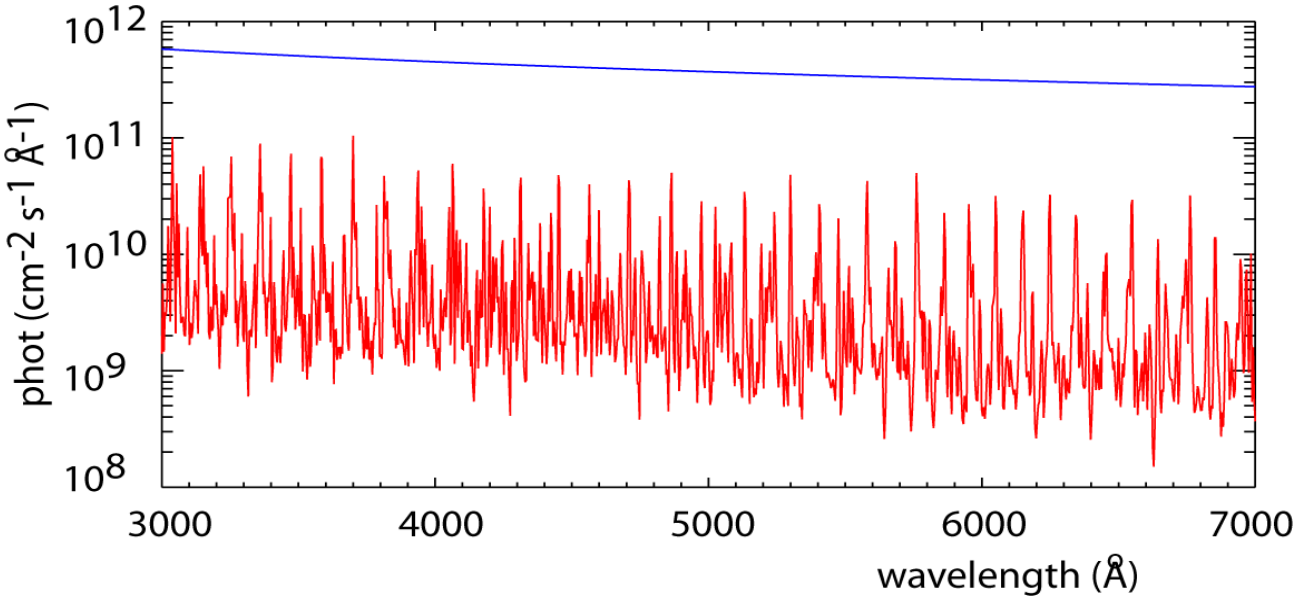
- There are two new codes ADAS315 and ADAS316.
- ADAS315 works on the scale-able universal dataset of format ADF49 to produce an ADF01 data set.
- ADAS316 is a bundle-n population model. It requires a driver data set and, for bundle-n in ADAS, these have historically been archived in ADF25. A new sub-directory /a25_p316 has been assigned and a complete redesign of the driver has been carried out.
- Output ADF26 (the bundle-n population solution), ADF12 (charge exchange effective emission coefficients) and ADF40 (feature emissivity coefficients) may be produced.
- For heavy species CXS, because of the very large number of transitions between highly excited states, the ADF40 format becomes more useful that ADF12.

Patterns of CXS lines in the visible (contd)





ITER: tungsten CX compared with Bremsstrahlung



- 50 keV/amu D beam (diagnostic NB), JNBI=300A/m2, INBI=60A
- Using ITER scenario 2 (Te=20keV core, Ne=1x1014cm-3)
- No transport – steady state ionisation balance
- Assume looking vertically down on the beam at the core.
- No beam attenuation effects taken into account.
- W concentration = $1x10^{-6}$ of N_H