

# General interrogation programs

The programs of series ADAS5 are all interactive interrogation codes on elements of the fundamental and derived databases. This supplementary series has been found of use in analysis and interpretation. A schematic of the programs and dataset types interrogated is shown in figure 6.0. Each program extracts data from the relevant data collection, providing spline interpolation of that data at arbitrary values of the independent variables, together with a minimax polynomial fit to the data. Also, tabulation and graphical display are produced. The datasets are generally organised as indexed lists for convenience in extraction and use.

ADAS501 extracts *ionisation per photon* data, archived as a function of electron density and temperature in data type ADF13. It is of use in simplified analysis of spectral data in terms of impurity influx. The reciprocal of the ionisation per photon is called the *photon efficiency*. In general, data on many lines of each ion are available. An associated quantity of interest is the zero-density electron impact ionisation rate coefficient (type ADF07) extracted by program ADAS502. Note that this is the zero density coefficient, tabulated as a function of electron temperature only. The data sets of type ADF13 by contrast include full density dependence. Both sets of data are in a *metastable resolved* picture. The zero density radiated power coefficient (type ADF19) interrogated by ADAS504 is also provided.

The most complete form of derived spectral emission data are the photon emissivity coefficients (type ADF15), interrogated by ADAS503. These data are electron density and temperature dependent and metastable resolved. They can include electron impact excitation, inner shell ionisation, free-electron recombination and charge exchange recombination parts all separately identified and usable. Data for many spectrum lines of an ion spanning an extended spectral region from XUV to visible can be available.

More complex data are the  $G(T_e)$  functions which merge the photon emissivity coefficients of lines of an ion with an equilibrium ionisation balance of the ion with respect to the total abundance of the species. These data (type ADF20) are familiar in astrophysics but of equal use in laboratory plasmas. They are interrogated by program ADAS506. This code has the additional function of delivering a collection file for differential emission measure analysis. ADAS508 carries out a similar function but for true two-dimensional  $G(T_e, Ne)$  functions of type ADF32. Indexed one dimensional tabulations of generalised contribution functions are also provided (type ADF16), interrogated by ADAS507. This class of data is designed to allow generalisations of the  $G(T_e)$  functions above which can arise in time dependent, influx or specific spatial models.

ADAS509 interrogates state selective charge exchange cross-section data of type ADF24. It also can create an output dataset of thermally averaged charge exchange rate coefficients of type ADF14. These in turn are interrogated by ADAS505. The ADF14 tabulations are of

double Maxwell averages tabulated as functions of donor and receiver ion temperatures for use in edge plasma studies.

Figure 6.0

