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Improved analytical fits of collisionnal cross sections MICHEL BUSQUET[1], ARTEP, Inc. — Local Thermodynamical Equilibrium (LTE) is a powerful assumption to solve Atomic Physics problems. When LTE is not valid, one need to solve the "rate equations" governing the population kinetics of a large set of atomic states. A very large number of transition rates, radiation and collision induced, is required. However, computing collision cross sections S(E), where E is the energy of the incident electron, is costly and furthermore has to be integrated over the distribution function of electrons. One generally use a fit of S(E) from 5-20 energy samples before analytical or numerical integration. The classical Sampson & Golden's fit is generally used : S(E) = A +D ln(u) + c1/(a+u) + c2/(a+u)^2 where u is the electron energy divided by the transition energy. However in multi-charged, multi-electron high Z ions, it leads to poor fits, with often negative rates,for about 20% of the total number of excitation rates, even using the Born limit at high energy as a constraint. From some examples, we shall expose the requirments for an adequate fit and propose a tractable and efficient fit to replace the S&G formula. The fit will be distributed with the HULLAC.v9 suite of codes in a near future.

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