Atomic data in the active beam spectroscopy of fusion plasmas

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The atomic data used in the neutral beam drive spectroscopy can be divided in several sections: atomic data used to simulate the beam penetration only, atomic data used for fast ion diagnostics, the data for the charge-exchange recombination spectroscopy and finally the atomic data for the beam-emission spectroscopy and Motional Stark effect.

Whereas the *eigenstates* of the beam atoms in fusion are the solutions of the Schrödinger Equation for hydrogen atom in the crossed electric and magnetic fields the different approximations are used to describe the beam atoms in the plasma:

The *statistical* models are until now the most common and the simplest models describing the ground and excited levels of the beam. The second type of models are the so called *nl* resolved model. These models provide more accurate descriptions for the beam –emission data, however, they can be not applied for the population's calculations. Finally, the most accurate type of models used now is the model using the parabolic states. The advantage of this model is also the application of the field ionization induced by the electric field.

The transitions between different atomic models, limitations, pitfalls and current status of the collisional atomic data will be shown in this work.