Laboratory astrophysics: EBIT spectra around the EUV bands of the SDO/AIA instrument

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Solar observations in the Extreme Ultraviolet (EUV) strive for high cadences (high exposure frequency) in order to capture the temporal variability of the conditions in the solar environment. The AIA experiment onboard the *S*olar Dynamics Observatory (SDO) spacecraft [1] achieves this by observations in seven channels, each of which based on a multilayer mirror for light gathering and wavelength selection. The seven observation channels target 6 bands (94, 131, 171, 193, 211, 355 Å) with prominent iron lines and the bright He II line at 304 Å. In combination and supported by extensive modeling, the observations permit the observer to establish the temperature in the solar coronal field of view. The seven data channels have spectral band passes from 1 Å to about 20 Å. In parallel, and in a 10 s cadence, a grating spectrograph monitors the EUV spectrum with a band width of 1 Å.

Our laboratory approach is complementary to this. An electron beam ion trap (EBIT) offers the laboratory environment closest in density and working conditions to the solar corona. Various elements of coronal interest (He, C, N, O, F, Ne, Mg, Si, S, Ar, Ca, Fe, Ni) are introduced into EBIT and ionized and excited by an energetic electron beam. The EUV spectra in the vicinity of the SDO/AIA observation channels are studied with spectrographs of resolving powers 1100 to 3000 and at various electron beam energies. We thus check the consistency and completeness of the spectral data that are used in the collisional-radiative modeling necessary for the interpretation of the SDO/AIA raw data.

We mainly compare our observations with the NIST on-line data base [2] and with the CHIANTI data base (v. 7.1) [3]; the latter compiles wavelength data and models the relative line intensities. We note that the CHIANTI wavelengths are more consistent with our observations. However, we also find a number of spectral lines that may have been underappreciated in the spectral models. Of our work in progress, the results for the vicinities of the 131 and 211 Å AIA channels have been submitted for publication [4,5].

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