Explanation of Effective Z and Quantum Defect Calculation

It looks like Dr. Aufdenberg pointed out an issue with the 'Effective Z' value you are using in your quantum defect calculation. In your code or calculations, you're using an incorrect value of 11 for 'Effective Z,' but the correct value is 1 for neutral sodium (Na), which could be the source of the problem with your results. The 'Effective Z' is important because it influences the energy levels and transitions for the atoms you're studying.  
  
Here’s what’s likely happening in your code:  
  
- The \*\*Effective Z\*\* is a parameter used in calculating energy levels and wavelength transitions. It reflects the effective nuclear charge experienced by the electron in an atom or ion, which depends on the electron shielding effects.  
  
- For \*\*neutral sodium (Na)\*\*, the Effective Z should indeed be close to \*\*1\*\*, not 11. The value 11 would correspond to a highly ionized species like sodium in a much higher oxidation state, which is not relevant here.  
  
If you're getting low values for your results, it’s a good bet that the Effective Z value of 11 is causing unrealistic energy levels or wavelengths. Once you adjust it to 1, your calculations should yield more reasonable results for the sodium transitions.  
  
In your next steps, after fixing the \*\*Effective Z\*\* parameter, you should get more consistent wavelength values in line with the experimental data and theoretical predictions for Na-S transitions.  
  
As for the code, make sure that the input wavelength is in a reasonable range and corresponds to the expected transition in the UV spectrum. Sodium's D-lines (Na D1 and Na D2) are in the visible spectrum, but higher transitions might fall into the UV range, so your code’s input and expected wavelengths should be consistent with this.  
  
Let me know if you'd like to dive deeper into the code or the physics behind it!