Implementation of MSE Wavelength-Interpolation Subtraction on KSTAR*  

**Abstract**
A novel one-pass algorithm for removing the background from the lower frequency data to provide accurate, high-resolution wavelengths on the MSE detector has been successfully implemented at KSTAR. The algorithm takes advantage of the non-linear relationship between the wavelength and the magnetic field strength, which allows the background to be modeled as a function of the magnetic field. This model is then used to subtract the background from the data. The accuracy and reliability of this method have been demonstrated through comparisons with existing methods and through direct observations of the resulting data.

**Wavelength Interpolation vs Time Interpolation**
Code supports standard time interpolation of background data plus multiple options for wavelength interpolation. Interpolation techniques lack more accurate than standard time interpolation.

**The Problem**
MSE requires a very high signal-to-noise ratio of the background, in order to achieve acceptable accuracy (e.g. 0.10-0.05%)

**The Solution: hardware**
- Non-linear wavelength dependence on the background
- Highly correlated with the background
- Background vs. magnetic field strength is not linear
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**Background and S/N**
The ratio of the generated polarized light to the polarized background light decreases strongly with density, but can be higher (better) in core regions, owing to enhanced MHD activity.

**Performance assessment**
The accuracy of the magnetic field strength from the MSE detectors was compared with that of an independent diagnostic. The MSE detectors were shown to be accurate within 0.1% of the independent diagnostic. The MSE detectors were also shown to be reliable, with a standard deviation of less than 0.05%.

**Looking forward to KSTAR**
The development of the MSE detectors continues, with plans to further improve the accuracy and reliability of the magnetic field strength measurements.

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