Review of the 7th Spectral Line Shapes in Plasmas code comparison workshop.

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Spectroscopy is one of the richest sources of plasma diagnostics [1]. Since diagnostics are based on the comparison of observed and modeled data, accurate theoretical models of atomic physics and radiation are required to be reliable.

The modeling of spectral lines in plasmas, which involves a complex combination of atomic physics, statistical physics and plasma physics, plays a crucial role in the interpretation of spectroscopic observations. Except for a few special cases, the calculation of line profiles in plasmas requires the use of numerical codes. There are a number of such codes, more or less complex, which necessarily differ in their scope and accuracy. To verify the accuracy and validity of models and codes, it is necessary to compare them to well-characterized reference experiments, when these exist, or to test them by comparing them to other models.

The SLSP (Spectral Line Shapes in Plasmas) Code Comparison Workshop was established in 2012 to encourage and facilitate such comparisons, which were almost non-existent [2]. Six editions of this workshop, organized in cooperation with the International Atomic Energy Agency (IAEA), have been held to date, during which a large number of diverse problems have been analyzed. The result has been a better understanding of the underlying phenomena and more accurate models [3, 4, 5, 6]. However, despite the progress made, several problems remain open, such as the interpretation of white dwarf spectra [7, 8] or those of WDM experiments [9].

In this talk, a report of the 7th SLSP, held in Gran Canaria, Spain, from 30 September to 4 October 2024, will be presented. A variety of topics were covered, ranging from standard cases that are highly demanding for codes and models to modeling experimental data and studying effects first addressed at SLSP such as Van der Waals broadening, the motional Stark effect (MSE), and periodic electric fields in the presence of a constant magnetic field.

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