Towards a probabilistic approach for DAC exact reconstruction

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Absract

Spectral lines of many Oe and Be stars show Discrete Absorption Components (DACs). Disentangling the line components and identifying the physical mechanisms that produce them is a complex procedure, which is relying on many unknown parameters. The number of components that make up each line is one of the factors that need to be defined before examining the physical procedure producing the line profile.

A novel probabilistic approach is proposed to address the problem of the exact reconstruction of DAC's spectra. According to the discussion done above the problem is decomposed to the followings items: first the problem of estimating the exact number of the line components that interfere and second the problem of estimating the statistical characteristic of each line component such as variance of the line or higher statistical moments that affect the shape of the DAC spectrum.

The proposed probabilistic approach is based on the observation that the DAC lines may be treated as random signals which can be considered as superposition of independent signals. The number of independent signals can then be considered equal with the number of the interfered lines that make up the DAC.

The above observation is of crucial importance since in probability theory, it is well known that the superposition of independent random variables leaves a trace in the corresponding correlation function of the total random signal. Moreover it is proposed that the determination of the higher statistical moments can be done based on the observation that each of the interfered independent random signals is Gaussian-like signals in spectral space.

Stark Broadening of Spectral Lines of Inert Gases

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Abstract

We summarize our previous results of spectral line broadening with application for astrophysical purposes. We examine the broadening and shifting of spectral lines due to charged particles – Stark broadening. The calculated results for Stark broadening parameters of several Ar I and Ne I lines in the wide temperature range are included. The semiclassical theory of Sahal-Bréchot in impact approximation is applied.