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QUANTUM STARK BROADENING OF Ar XV LINES

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Stark broadening mechanism is important in stellar spectroscopy, astrophysical and laboratory plasmas analysis. Its influence should be considered for the opacity calculations, the modelling of stellar interiors, the estimation of radiative transfer through the stellar plasmas and for the determination of chemical abundances of elements [1]. The need for spectral line broadening calculations is stimulated by the development of computers. Moreover, the development of instruments and space astronomy, such as the new X-ray space telescope *Chandra*, stimulated the calculations of line broadening of trace elements in the X-ray wavelength range. The recent discovery of the far UV lines of Ar VII in the spectra of very hot central stars of planetary nebulae and white dwarfs [2] showed the astrophysical interest for atomic and line broadening data for this element in various ionization states. Ar XV is one of these important ions. The only Ar XV line broadening calculations existing in the literature are the semiclassical ones [3,4], where the authors claimed that there are no experimental or other theoretical results for a comparison. Using our quantum formalism [5,6], we perform in the present paper quantum Stark broadening calculations for some Ar XV spectral lines within the X-ray wavelength range. Detail comparisons show an acceptable agreement with the semiclassical results.

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PHYSICAL PARAMETERS OF THE RELATIVISTIC SHOCK WAVES IN A SAMPLE OF GRBs WITH MULTI-PEAKED LIGHT-CURVES

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The Gamma Ray Bursts (GRB) are sudden, elusive phenomena. The current interpretation of these events involves a fraction of the huge amount of gravitational energy associated with the formation of compact objects. This energy is deposited as kinetic energy of thin shells of material in a relativistic collimated outflow. The interactions among these shells and the presence of shocks yield to the GRB prompt emission. Despite this acknowledged sketch of the so called Internal Shock model, even after decades we still do not know much about the physical characteristic of these phenomena. In this work we develop a modified phenomenological model that reproduce the physical situation during the prompt γ-ray emission in a catch-up scenario (Simić & Popović, 2012) and we apply it to fit a sample of GRBs with multi-peaked light-curves. From the fitting procedure then we can extract basic parameters of the relativistic shock waves and look for various correlations among them, in order to give more detailed sight behind the GRB events.