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VARIABILITY OF GRB LIGHT CURVE: SHOCK WAVE MODEL MODIFICATION

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Abstract. The main topic of our investigation is a mysterious phenomena of gamma ray bursts. If someone analyze the observation of these events, its emerge that most interesting data are among the gamma phase, during the first couple of seconds. In this stage a central engine generates high intensity and high energy radiation, observed in the form of pulses in the light curve. If we could understood the main physical processes in this phase, we could put some constraints for the model which try to explain the core of this phenomena, deeply hidden from observation by high optical thickness of surrounding material.

Observation of the GRB light curve can be easily done with the help of modern satellites, so the data of this kind are vastly dispersed. We try to analyze them and to explain in details physical process which create the light curve pulses. Our research is based on the broadly accepted scenario of a gamma phase in GRBs, which predicts that GRB core generates highly relativistic mater in some amount of time. This mater form a shock waves of different velocities, due to highly differential motions. The shock waves can interact with each others, and in that moment radiation significaly increases, creating the observed pulses in the GRB light curve. We develop a phenomenological model based on the model developed by Huang and coauthors, to explain evolution of shock wave expanding from some distance. In it, we implemented the ability to simulate collision between an incoming shock and density barrier. We also propose that density barrier is created by the material ejected from the core and spread around by the shocks. As a result of simulation we can get synthesized pulses, and by comparing them with the observational data we can acquire values of basic parameters used in our model.