N01a X- Ray and Gamma-Ray Emission from the PSR 1259-63 / Be Star System

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PSR 1259-63 is a 48 ms pulsar orbiting a Be star in an eccentric 3.4 year orbit. Soft and hard X-rays are observed from this system. The X-ray spectra are well represented by a power law function with a photon index of 1.6 - 2.0. Pulsation is absent in the X-ray intensity. The X-ray luminosity around the periastron is about an order of magnitude higher than that around the apastron, while the spectral shape is steeper at periastron than at apastron. We study the shock powered emission model, especially focusing on the luminosity and spectral variation with orbital separation. The collision of the pulsar and Be stellar winds forms a shock, which accelerates particles to the relativistic energies. We derive the energy distribution of relativistic particles as a function of the distance from the shock in the pulsar nebula. We calculate the X-rays and gamma-rays emitted from the relativisitic particles in the nebula, taking into account the Klein-Nishina effect fully. The shock powered emission model can explain the observed X-ray properties approximately. We obtain from the comparison with observations that a fraction of ~ 0.1 of the pulsar energy flux should be transformed into the final energy of non-thermal relativistic particles. We find that the magnetization parameter of the pulsar wind is ~ 0.1 and may decrease with distance from the pulsar. We show the constraints on the flow pattern of the Be stellar wind. We predict the GeV - TeV gamma ray emission which may be observable in the future programs.