The Faint Halo of the Planetary Nebula NGC 6543

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NGC 6543 is a mutiple shell planetary Nebula (PN) of which the bright core is enshrouded by the faint giant halo. The faint outer halo is thought to be the remnants of the original red giant wind. The HST/WFPC2 [OIII] narrow band filter images indicate much higher temperatures in the outer halo region than in the inner bright core, i.e. 15000 K vs. 8500 K (Kim et al 1999). Using ISA-Wind non-LTE unified model atmospheres (Koter, in private communication), we have determined the basic parameters of the central star and the bright H II region core of NGC 6543 - we employ the radiation field from a Wolf-Rayet type star as well as the wind driven by its radiation pressure. The photo-ionization models are used to reproduce the conditions of the halo: by employing both the hardened and un-hardened radiations (due to the non-spherical symmetrical core H II region, optically thick in one direction but optically thin in the other directions), we investigate whether the halo atomic lines emitted as a result of photo-ionization (Photon Dominated Region). Here, a high filling factor is introduced to mimic the filamentary blobs in the halo. The temperature of the filamentaries in the halo region might become higher when the hot fast wind flows past them (BOW-SHOCK HEATING). The origin of filamentary structures, however, was not known even till now. Using both SPH and TVD code simulations, we investigate whether the filamentary blobs can be formed due to a pulsation of the central star in its evolutionary phase, RGB stage. The shock heating temperatures in the halo are also derived from our simulation.