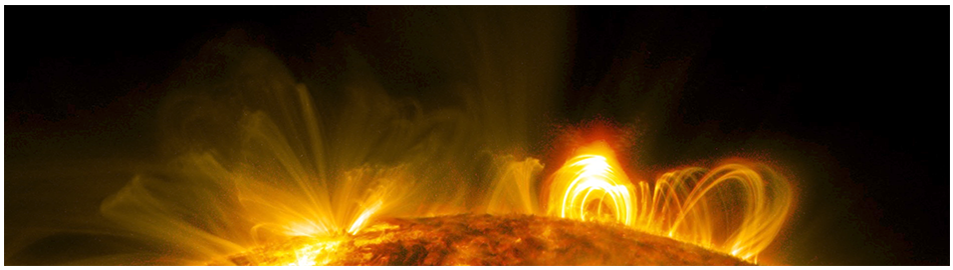

Contribution ID: **29** Type: **Invited talk**

Particle Acceleration in Massive Stellar Binary Systems

Monday 15 November 2021 11:30 (30 minutes)

The majority of massive stars form a binary system with another massive star. Their strong winds with velocities at 1000-3000 km s^{-1} collide between the two stars and produce stationary shocks. Several so-called colliding wind binary systems (CWBs) within a few kpc from the Sun produce shock-heated plasmas at ~3-5×10^{7} K and emit luminous X-rays up to ~10^{34-35} ergs s^{-1}. The shock should also accelerate a small number of particles to relativistic energies via the Fermi mechanism. In the 2010s, the NuSTAR and Fermi observatories with excellent sensitivities in the extremely hard X-rays (>10 keV) or GeV gamma-rays detected signatures of the accelerated, non-thermal particles from eta Carinae, a supermassive star with the strongest colliding wind activity in our Galaxy. The spectra suggest at least two components, perhaps originating from pion-decay radiation or inverse-Compton radiation of stellar UV radiation upscattered by the accelerated particles. I introduce the current understanding of particle acceleration in massive CWBs.

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Session Classification: Day 1 / Session 3