Contribution ID: **424** Type: **Oral**

Particle acceleration beyond the synchrotron burnoff limit in gamma-ray binary systems

Thursday 28 August 2025 14:50 (17 minutes)

Gamma-ray observations can constrain particle acceleration in astrophysical sources only when combined with realistic emission scenarios. A key question is whether the radiation originates from relativistic electrons or protons. While several criteria exist to distinguish between leptonic and hadronic origins, they often remain inconclusive at ultra-high energies. For instance, the synchrotron counterparts of leptonic emission may peak in the MeV band, where sensitivity is limited, while the detection of neutrinos at expected flux levels remains elusive. In such cases, arguments based on maximum attainable particle energies become critical. Recent ultra-high-energy observations of binary systems indicate that, under certain conditions, electrons can overcome the synchrotron cooling limit. This mechanism, if confirmed, may also operate in other sources with ultrarelativistic outflows, such as pulsar wind nebulae and gamma-ray bursts.

Collaboration you are representing

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Session Classification: High-Energy Astrophysics and Cosmic Rays

Track Classification: High-Energy Astrophysics and Cosmic Rays