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# A gamma-ray enhancement event in Tycho's supernova remnant

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We will present a γ-ray enhancement event detected from Tycho’s supernova remnant (SNR), which lasted for 1.5
years and showed a factor of 3.6 flux increase mainly in the energy range of 4–500 GeV. While several young SNRs (including Tycho’s SNR) were previously found to show peculiar X-ray structures with flux variations in one- or several-year timescales, such an event at γ-ray energies is for the first time seen. The hard γ-ray emission and year-long timescale of the event necessitate a synchrotron radiation process, although the required conditions are either ultra-high energies for the electrons in the process, upto ~10 PeV (well above the cosmic-ray “knee” energy), or high inhomogeneity of the magnetic field
in the SNR. This event in Tycho’s SNR is likely analogous to the γ-ray flares observed in the Crab nebula, the comparably short timescales of them both requiring a synchrotron process, and similar magnetohydrodynamic processes such as magnetic reconnection would be at work as well in the SNR to accelerate particles to ultra-relativistic energies. The event and its implications thus reveal the more complicated side of the physical processes that can occur in young SNRs.

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