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# Study of Galaxy Evolution Using VHE $\gamma$-ray Observations with Ground-based Čerenkov Telescopes

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**Abstract.** The spectral distribution of the extragalactic background light (EBL) in the infrared yields important information about the evolution of galaxies. The spectrum of a galaxy in the 0.1–200 $\mu$m region is a footprint of the intrinsic starlight at $\sim 1\mu$m and its extinction by dust with re-emission at $\sim 100\ \mu$m. The overall spectral energy distribution of the EBL is then determined by the galaxy luminosity evolution. High-energy $\gamma$-rays are absorbed by the EBL photons through $\gamma\gamma \rightarrow e^+e^-$ reactions. Such an effect has been seen recently in the Mkn 501 TeV spectrum measured by the HEGRA (High Energy Gamma Ray Astronomy) collaboration using an advanced system of imaging atmospheric Čerenkov telescopes (IACTs). The intrinsic spectra of AGNs in the 50 GeV–1 TeV energy range may be constrained by the X-ray fluxes measured with satellite instruments aboard missions such as RXTE, XMM, and ASCA. By reducing the energy threshold down to 50 GeV, forthcoming ground-based IACTs systems (CANGAROO IV, H.E.S.S., VERITAS) may be able to study the absorption cutoff in energy spectra of distant AGNs (z$<$ 0.4), to unfold the true galaxy luminosity evolution function.

## Discussion

Martin Harwit: You and your colleagues have recently put upper limits on the fraction of the highest energy TeV photons that could consist of Bose-Einstein condensations of lower-energy photons masquerading as higher-energy $\gamma$-rays (an idea suggested by Harwit, et al. 1999, ApJ, 524, L91). One looks forward to even tighter constraints on this possibility, to make sure that we are really estimating the IR background correctly.

Alexander Konopelko: I agree completely. We could do it much more accurately for an extended Mkn 501 data sample, if we are lucky enough to detect another flare.