

Erratum

MAGIC observations of the February 2014 flare of 1ES 1011+496 and ensuing constraint of the EBL density

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ABSTRACT

We found a mistake in the parameters for the fits of two functions to the observed spectrum of 1ES 1011+496 given in Section 3 of Ahnen et al. (A&A, 590, 24A, 2016). We found that this error does not affect the main result of the original paper which is the computations of the constraints to the extragalactic background light density.

Key words. gamma rays – cosmic background radiation – BL Lacertae objects – errata, agenda

We found an error in the parameters reported in Section 3 of the original paper (Ahnen et al. 2016) for the fits of different functions to the observed spectrum of 1ES 1011+496 measured by the MAGIC telescopes.

In Section 3, third paragraph.

“photon index $\Gamma = 2.0 \pm 0.1$ and normalization factor at 250 GeV $f_0 = (5.4 \pm 0.1) \times 10^{-11} \text{ cm}^{-2} \text{ s}^{-1} \text{ TeV}^{-1}$ ”
should be replaced by

“photon index $\Gamma = 2.03 \pm 0.03$ and normalization factor at 250 GeV $f_0 = (8.70 \pm 0.17) \times 10^{-10} \text{ cm}^{-2} \text{ s}^{-1} \text{ TeV}^{-1}$.”

A few lines below in the same paragraph.

“achieves an acceptable fit ($P = 0.17$, $\chi^2/\text{d.o.f.} = 12.8/9$), although with a sharp change of photon index by $\Delta\Gamma = 1.35$

within less than a factor 2 in energy. For the SBPWL, the normalization factor at $E_0 = 250 \text{ GeV}$ is $f_0 = (4.2 \pm 0.2) \times 10^{-10} \text{ cm}^{-2} \text{ s}^{-1} \text{ TeV}^{-1}$, the first index is $\Gamma_1 = 0.35 \pm 0.01$, the second index $\Gamma_2 = 1.7 \pm 0.1$, and the energy break $E_b = 298 \pm 21 \text{ GeV}$. Among the other, smoother functions, the next-best fit is provided by the LP (shown in Fig. 2), with $P = 1.7 \times 10^{-3}$ ($\chi^2/\text{d.o.f.} = 29.8/11$). The photon index for the LP is $\Gamma = 2.8 \pm 0.1$, curvature index $\beta = 1.0 \pm 0.1$ and normalization factor at $E_0 = 250 \text{ GeV}$ $f_0 = (3.6 \pm 0.1) \times 10^{-10} \text{ cm}^{-2} \text{ s}^{-1} \text{ TeV}^{-1}$ ”

should be replaced by

“with $g = 12.6$, achieves an acceptable fit ($P = 0.23$, $\chi^2/\text{d.o.f.} = 12.8/9$), though with a sharp change of photon index by $\Delta\Gamma = 1.34$ within less than a factor 2 in energy. For the SBPWL, the normalization factor at $E_0 = 250 \text{ GeV}$ is $f_0 = (6.23 \pm 0.28) \times 10^{-10} \text{ cm}^{-2} \text{ s}^{-1} \text{ TeV}^{-1}$, the first index is

$\Gamma_1 = 2.35 \pm 0.08$, the second index $\Gamma_2 = 3.69 \pm 0.09$, and the energy break $E_b = 298 \pm 21$ GeV. Among the other, smoother functions, the next-best fit is provided by the LP (shown in Fig. 2), with $P = 1.7 \times 10^{-3}$ ($\chi^2/\text{d.o.f.} = 29.8/11$). The photon index for the LP is $\Gamma = 2.84 \pm 0.03$, curvature index $\beta = 1.00 \pm 0.05$ and normalization factor at $E_0 = 250$ GeV $f_0 = (5.75 \pm 0.16) \times 10^{-10} \text{ cm}^{-2} \text{ s}^{-1} \text{ TeV}^{-1}$

After a thorough review of the original paper we have concluded that this change on fit parameters does not affect the results presented in Sections 4, 5, 6 and 7, neither affects what is shown in any the Figures.

References

Ahnen, M. L., Ansoldi, S., Antonelli, L. A., & et al. 2016, A&A, 590, A24

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