A remark on "Cosmic gravitational background radiation as a basis of Karolyhazy hazy space-time" by G.-W. Ma

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Abstract


Ma [1] has recently claimed that, starting with a reasonable gravitational background radiation, he can deduce the spectrum of space-time fluctuations of a certain model [2], and he claims that this spectrum is cosmologically sensible. However, the spectrum he has deduced differs from the true spectrum of this model which I and Lukács [3] criticized as being cosmologically untenable.

Unfortunately, there is a crucial error in Ma’s deduction, which can easily be detected.

Ma’s calculations start with a certain plain wave expansion of the gravitational radiation, see Eqs. (10)–(21). The amplitudes of the two independent polarizations of the plane wave are denoted by $\delta$ and $C$, respectively. The gravitational energy $W$, i.e. the volume integral of the r.h.s. of Eq. (19), is then expressed in terms of the author’s amplitudes $\delta$ and $C$. I note here that the energy of plane waves should always be positive. However, Ma’s energy expression (21) is indefinite: the terms proportional to $C^2$ have been left out.

I have calculated the term missing from Eq. (21),

$$W(\delta)(\text{missing}) = \frac{c^4 V}{32\pi G} \sum_k k^2 C(\delta)^2.$$  

This term is absolutely relevant for what Ma is going to do later in his Letter. The author’s claim is based on the extreme smallness of a certain function $D^2$ which governs the intensity of fluctuations. It is bounded by $D_{\text{up}}^2 \sim 10^{-12}$ as the Letter states. Now, the missing term above, when added to Ma’s incomplete expression (21), amounts to the change $D^2 \to 1 + D^2$, as may be seen from Eq. (24). The smallness of $D^2$ disappears in the correct plane wave expansion of the energy. This, in itself, invalidates the Letter’s claim.

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References
