Temat: GERG-D-18-00302 - Your Submission

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Short-lived flashes of gamma radiation in a quasi-spherical Szekeres metric General Relativity and Gravitation

Dear Prof. Dr. Krasinski,

Reviewers have now commented on your paper. You will see that they are advising that you revise your manuscript. If you are prepared to undertake the work required, your revised paper will be reconsidered for publication.

The reviewer comments can be found at the end of this email or can be accessed by following the provided link.

If you decide to revise the work, please submit a list of changes or a rebuttal against each point which is being raised when you submit the revised manuscript.

Your revision is due by 18-11-2018.

If we do not receive your revision by then your submission may be removed from our list of pending papers. In case you still wish to submit the paper after withdrawal, it will be considered as a new submission.

To submit a revision, go to https://gerg.editorialmanager.com/ and log in as an Author. You will see a menu item call Submission Needing Revision. You will find your submission record there.

With kind regards,

Editorial Office General Relativity and Gravitation

Reviewer comments:

Associate Editor: I am unhappy about the refereeing of this paper in the following sense. I have been trying to obtain a referee from among the astrophysics community studying GRBs, as a balance with a referee more from the relativity community, but I have so far failed. The author is understandably becoming impatient. Fortunately the one report received looks to be a very careful and thorough one, even though in my opinion it is too strong on the issue of compatibility of Szekeres models with observation, so I am happy to make an interim decision based on it and to try again to find an astrophysics referee if/when a revision arrives that meets the criticisms made.

Reviewer #1: In this paper the author continues his work on a non-orthodox explanation of gamma-ray bursts. The idea is that gamma-ray bursts have a cosmological origin: The emission that we see was produced near the hypersurface of last scattering, i.e., in the (re)combination era when neutral hydrogen and helium atoms were formed, by transitions in the shells of such neutral atoms. The produced photons had originally frequencies in the optical but they became blue-shifted when travelling through the universe so that we see them as gamma rays. In order to get the desired blue-shift the author assumes a cosmological model that consists of quasi-spherical Szekeres (QSS) regions embedded into a Robertson-Walker cosmos. The anisotropic QSS regions are chosen such that they produce a high blue-shift in particular spatial directions and they are arranged such that such a blue-shifted signal is seen only for a short time. The calculations are analytical as far as possible and then supported by numerical studies.

I tried my best to read the paper without a prejudice. However, the more I thought about the suggested model the more I found it untenable. Even apart from the connection to gamma-ray bursts I don't think that the cosmological model is viable: It is a dust model (no dark energy) and it assumes that there are strong deviations from a homogeneous and isotropic model. It is already very difficult, although maybe not quite impossible, to explain the apparent accelerated expansion of the universe by inhomogeneities, rather than by assuming the existence of dark energy. Even more importantly, I cannot believe that the model suggested here could be in agreement with the observed isotropy of the cosmic background radiation. Studying Szekeres models, and other cosmological models with little or no symmetries, certainly has its merits: However, I firmly believe that the deviations from homogeneity and isotropy cannot be so big as assumed in this paper .

The relation to gamma-ray bursts is even more problematic. The author aims at constructing a spacetime model where the observed frequency and the duration of gamma-ray bursts comes out in agreement with observation. However, it would also be necessary to explain the observed energy fluxes of gamma-ray bursts. In the standard interpretation the energy output of a gamma-ray burst is enormous. In the present model the energy output must even be bigger because the emission event is assumed to be much farther away than in the standard interpretation. I cannot see any reason why transitions in the electron shells of neutral hydrogen or helium atoms near the hypersurface of last scattering could be associated with such an enormous energy output. One would have to assume that the spacetime geometry produces not only a blue-shift in certain directions but also a gigantic focussing effect. I cannot see that the model suggested here does anything of the kind.

At least for the long gamma-ray bursts there are several other problems. (It is my impression that the author suggests that ALL gamma-ray bursts, long and short, are of a cosmological origin.) Since the late 90s we have instruments that are sensitive enough so that we observe an afterglow for almost all long gamma-ray bursts. For many of them we have (spectroscopic, not just photometric) redshift measurements. The observed redshifts are all positive, with a maximum between 2 and 3, whereas in the model suggested in this paper they should be negative. I emphasize that in many cases the redshift is measured by indentifying absorption lines of heavy elements. How could these lines be explained in the model suggested here? We would have to assume that, by pure coincidence all these observed gamma-ray signals have been travelling through a cloud of matter that is totally unrelated to the place where they have come into existence. This is against all probability. Moreover, almost all long gamma-ray bursts could be associated with a galaxy and many of them were accompanied by a supernova. Again, in the model suggested here all this would have to be just a series of coincidences. Of course, the probability for such coincidences is absurdly low.

For short gamma-ray bursts we do not usually observe an afterglow and we do not usually have spectroscopic redshift data. However, also in this case we have the above-mentioned problem of the observed energy fluxes. That's why I come to the conclusion that the idea of this paper is not tenable, for NO type of gamma-ray bursts. (I mention in passing that there is no need for a new interpretation of short gamma-ray bursts: The kilo-nova model, which associates them with merging neutron stars, got wonderful support by the gravitational wave signal GW170817 and its counterparts.)

I have thought for a while if the calculations on light propagation in QSS models could justify a publication in GRG, without the connection to gamma-ray bursts. However, I don't think that, as far as these aspects are concerned, the results go sufficiently far beyond the work in the author's earlier papers. The new aspect is a certain combination of QSS regions which is motivated only by the desired relation to gamma-ray bursts and hardly of any interest by itself. For this reason, I regrettably have to recommend that the paper be rejected.