Reply to "Phantom Energy and Cosmic Doomsday"

Dmitri Martila (eestidima@gmail.com)
Estonian Physical Society
Lääne 9-51, Tartu 50605, Estonia
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Perhaps is found mistake in most reputable journal (after the "Nature"), therefore the Doomsday can be more far away. Objection "there is Dark Matter, so General Relativity is wrong" is rejected in "Dmitri Martila, "Simplest Explanation of Dark Matter and Dark Energy", 2013, LAP LAMBERT Academic Publishing, ISBN 978-3-659-50275-0".

I. REVIEW OF [1]

Page 2: "According to general relativity, the source for the gravitational potential is the volume integral of $\rho+3p$." Me: no, my dear friends. The gradient of potential is caused not by uniform field of Phantom Energy, but by matter of the rigid planet and the star. I am sure, the planet's orbit can withstand the Phantom Energy way above mass of the star. It is like the deep ocean fish: the tremendous influence outside is compensated by the inner influence. Authors consider, e.g., the Earth, which orbits the Sun (Sun mass is M). Orbit radius is R. These ball mass is put as $m = (4/3)\pi R^3(\rho + 3p) + M$, where negative $\rho+3p$ is considered (obviously while Tolman formula [2]) as Phantom Energy mass-density. When would $m = 0$, the orbital motion disappears: Sun looses the Earth. But now is my opinion: because Phantom Energy is distributed homogeneously throughout all cosmos, also outside the Sun System, then these R-sphere does not produce antigravity, latter would rip the Earth away. In conclusion: the Big Rip remains, but it would happen much more later. Note, that Tolman formula holds for stationary metric within all spacetime and the physical system must be isolated (no phantom energy outside the R-sphere). That two conditions are violated.

The expanding Universe causes so called tidal forces on a planet. Suppose you have thin rigid stick with two masses m on the ends. Then the tidal force is $f = r\,d^2a/dt^2$, where the $2r$ is coordinate distance between masses. It is $r = L_0/a$, where $2\,L_0$ is proper length between masses. Suppose asymptotically ($a \gg a_0$) holds $da/dt = a^n$. Then $d^2a/dt^2 = n\,a^{n-1}\,da/dt = n\,a^{2n-1}$. And tidal force $f = r\,d^2a/dt^2 = L_0\,n\,a^{2(n-1)}$. On page 2 the authors have $n = (-3(1 + w) + 2)/2$. For supposed state of Dark Energy or Phantom Energy $w_{DE} < -1$ holds $n > 1$. But then $f = \infty$, as $a \to \infty$. Thus, there is Big Rip claimed, but it was derived wrong way. And due that, the Big Rip of the structure will occur at t_{rip}, and not much sooner as claimed by consideration with $\rho+3p$.

The value of $w_{DE} = -3/2$ is definitely excluded, because currently $w_{DE} = -1.00 \pm 0.06$ [3].

II. FINAL

The mistakes are not rare even in most top journals and prominentest authors, as prime example: Black Hole "Hawking temperature" in two abstracts of [4] is different. But must be the same, because it is his most famous discovery. Has the World gone with true one? As next example: "all" scientists used solution of dust collapse almost century, but it was wrong [5]. Outstanding person and a successful scientist Rudolf Peierls also noticed errors [6]. Honest work on the errors, as I understand, has not begun. You postpone everything until the Second Coming? But God speaks: Matthew 25:26.

[1] Robert R. Caldwell, Marc Kamionkowski, Nevin N. Weinberg, Phantom Energy and Cosmic Doomsday, Phys.Rev.Lett. 91, 071301 (2003) arXiv:astro-ph/0302506.

[2] Richard C. Tolman, Physical Review 35, 875-95 (1930), P.S. Florides, On the Tolman and Møller mass-energy formulae in general relativity, J. Phys: Conf. Ser. 189, 012014 (2009).

[3] E. Komatsu et al., Astrophys. J. Supp. 191, 18 (2011), K. Nakamura, et al., Review of Particle Properties. J. Phys. G 37, 075021 (2010), http://pdg.lbl.gov/2014/reviews/rpp2014-rev-bbang-cosmology.pdf.

[4] S.W. Hawking, Particle Creation by Black Holes, Comm. Math. Phys. 43, 199-220 (1975), S. W. Hawking, Black hole explosions? Nature 248, 30-31 (1974).

[5] Trevor W. Marshall, Max K. Wallis, Journal of Cosmology 6, 1473-84 (2010) http://journalofcosmology.com/MarshallWallis.pdf

[6] Rudolf Peierls, Surprises in Theoretical Physics, Princeton University Press, 1979; More Surprises in Theoretical Physics (Princeton Series in Physics), 1991.