On Doppler effects of supernovae Ia

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Date: February 2021

Status: draft

Summary

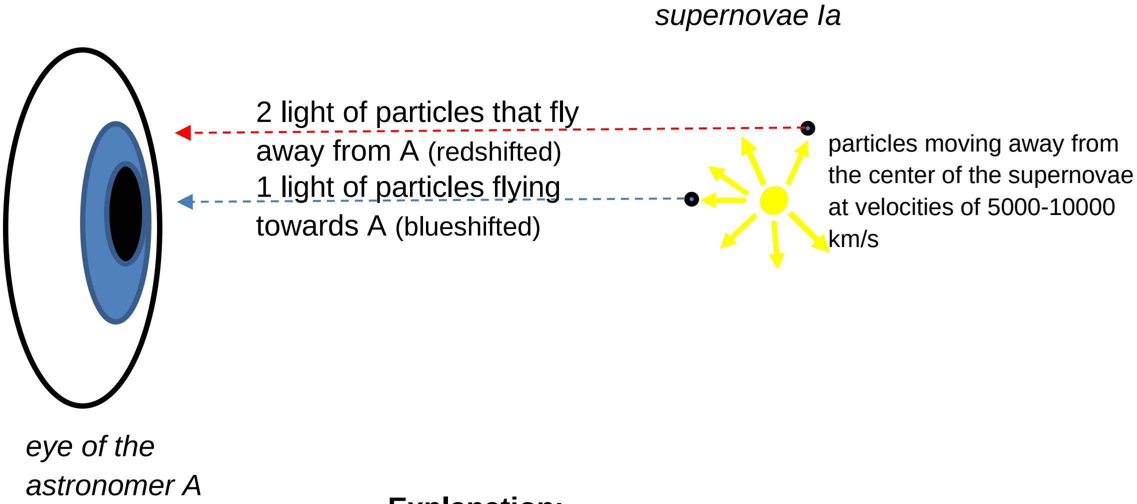
Could it be, that there is no dark energy, meaning expansion of the universe not being accelerated?

The distances of supernovae Ia with respect to expansion of space need to be reduced by Doppler blueshift, when compared to the results of estimating the distance due to light intensity reduction with respect to supernovae's parameters, and the assumption is, that this has not been done.

Doppler blueshift in supernovae Ia

The following picture illustrates the situation observing a supernovae Ia.

model of supernovae Ia



Explanation:

2) A sees the light of particles flying away from A redshifted because of Doppler effect and overlapped by redshift resulting from expansion of space. This kind of radiation however

will not be significant since it will be dominated by radiation of particles flying in the direction of A (see 1)).

1) A sees the light of particles flying towards A blueshifted by Doppler effect and overlapping redshifted due to expansion of space. The Doppler-blueshift factor $F_b := \lambda_{obs}/\lambda_{em}$ (wavelength observed by the one emitted) calculates to:

$F_b = \gamma*(1-\beta*\cos\alpha)$, with $\beta=v/c$, Lorentz factor γ and α being the angle between the flight path of the particle and the line of sight.

0) The table below shows values of F_b for different angle values α in the range of 0 to 30° (β=0,017 corresponds to v=5100 km/s, β=0,03 corresponds to v=9000 km/s):

β	F_b 0°	F_b 2°	F_b 5°	F_b 10°	F_b 20°	F_b 30°
0,017	0,98314	0,98315	0,98321	0,9834	0,98417	0,98542
0,03	0,97044	0,97046	0,97055	0,97089	0,97225	0,97446

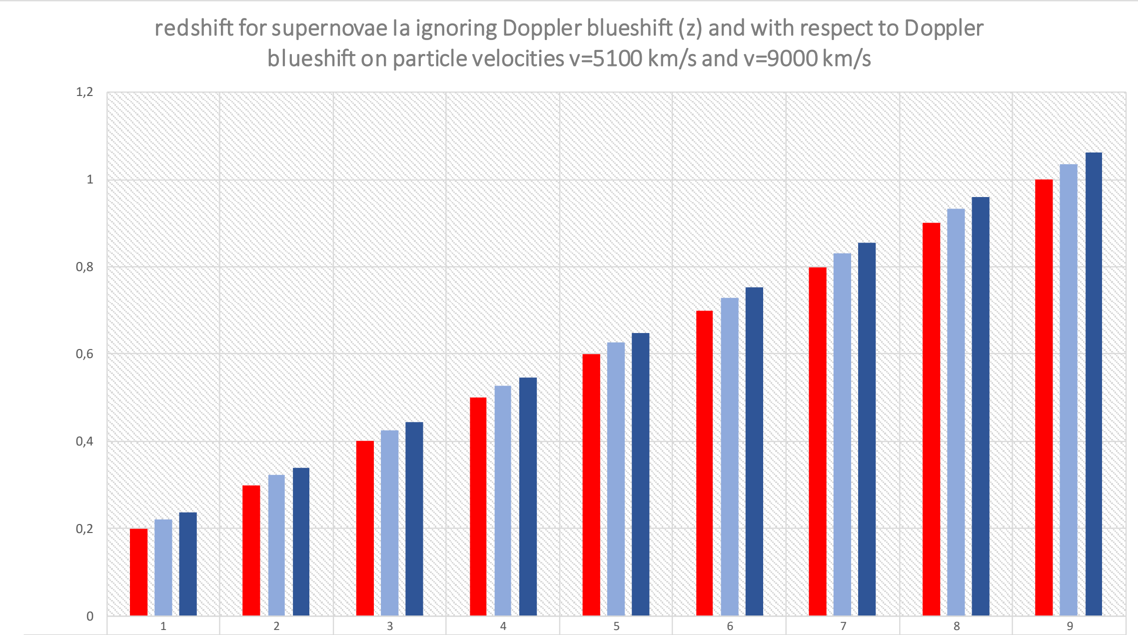
The table shows that values for same β do not differ very much. Therefore we will assume that α=0 from now on.

When we denote the redshift factor due to expansion of space by F_r, i.e. $F_r = 1+z_r$ with redshift z_r due to expansion, the following shall be true:

$F = F_b*F_r$

here F being the measured redshift factor, i.e. F = z+1 with measured redshift z. We can conclude: $z_r = F_r - 1 = F/F_b - 1 = (z+1)/F_b - 1 = z/F_b + (1/F_b-1)$. Note that $z_r > z$, since $z/F_b > z$ because of $F_b < 1$ due to blueshift and $(1/F_b-1) > 0$ for the same reason. For z_r --> 0 (approaching our location) z converges to $F_b*(1-1/F_b)$, which is the mere blueshift factor.

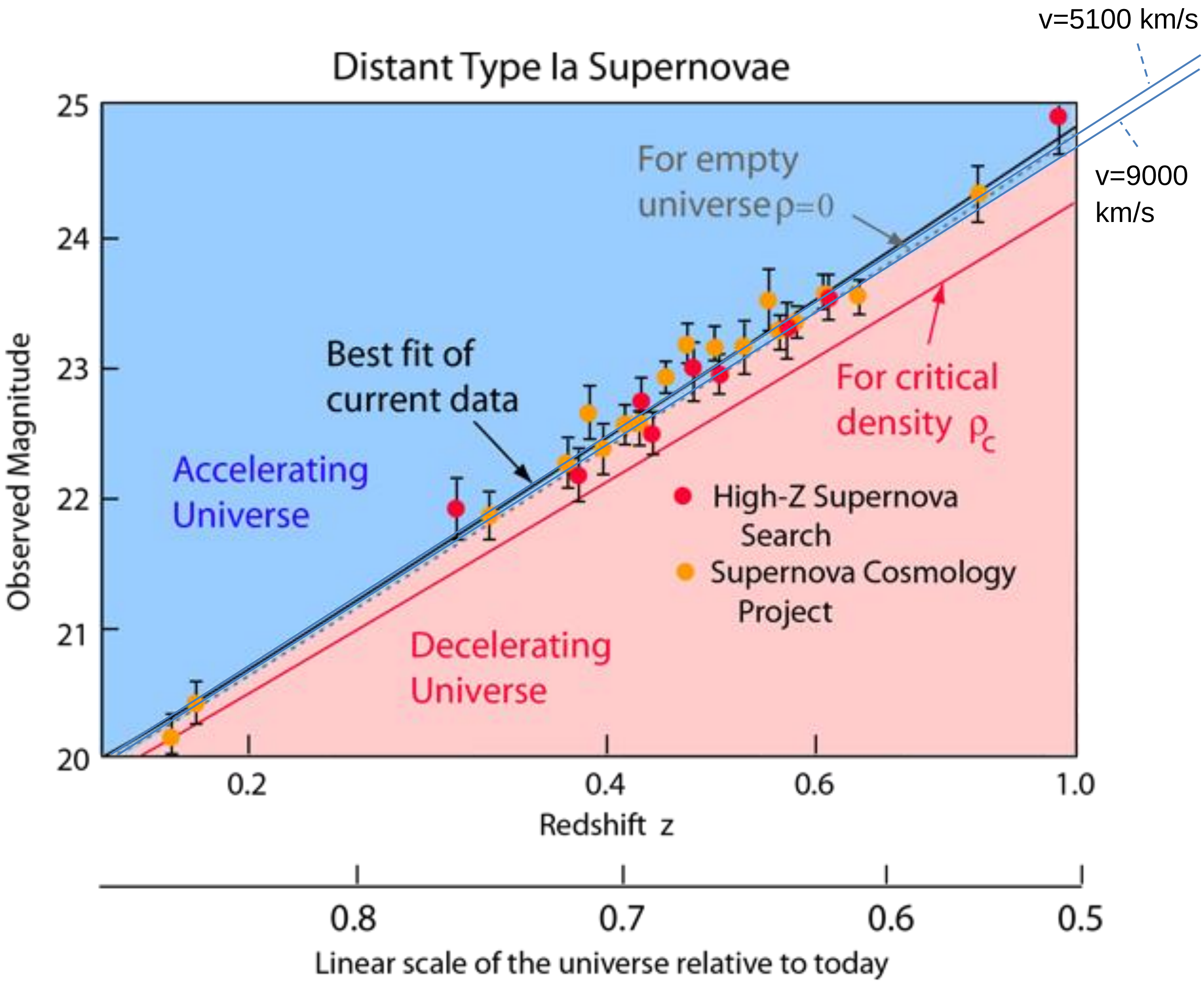
The next diagram shows the increasing of redshift when extracting the blueshift part for v=5100 km/s and v=9000 km/s respectively. These two velocities define the range of supposed velocity of particles in supernovae Ia.



	1	2	3	4	5	6	7	8	9
z	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1
z' 5100 km/s	0,220752798	0,322482197	0,424211597	0,525940997	0,627670397	0,729399797	0,831129196	0,932858596	1,034587996
z' 9000 km/s	0,237113402	0,340206186	0,443298969	0,546391753	0,649484536	0,75257732	0,855670103	0,958762887	1,06185567

z z' 5100 km/s z' 9000 km/s

When one includes these changes due to Doppler blueshift into the picture originally drawn by Perlmutter, Riess and Schmidt (Georgia State University, 2016),



then we see that redshift due to expansion of the universe modified according to Doppler blueshift will no longer be situated in the region of an accelerating expanding universe.

References

Daw, E. (2011, April). *E. Daw - Lecture 6 - The relativistic doppler shift of light.* Retrieved from The University of Sheffield: http://www.hep.shef.ac.uk/edaw/PHY206/Site/2011_course_files/phy206lec6.pdf#page=6