Appendix H to:
A Theoretical Investigation to the Physical Constraints for Light Velocity in Empty Euclidian Space and first Consequences for Long-distance Physics.

Referred equations: (6a), (9)

A first attempt to reconsidering the Hubble relation.

For a photon observed at current absolute time T_0 but sent form a distance d at corresponding time T_d according to equation (9):

(H.1) $$\gamma + d = \gamma \frac{T_0}{T_d}$$

where the scalar notation can be used since $\vec{\gamma}$ and vector d are in opposite directions. The corresponding photon velocity c_d at distance d is, according to equation (6a):

(H.2) $$c_d = \frac{\gamma + d}{T_d} = \frac{(\gamma + d)^2}{\gamma T_0}$$

As a first, simple attempt, assuming that the proportion between this 'distant' c_d and the observer's $c = \gamma/T_0$ also reflects the proportion in photon wavelengths, this leads to:

(H.3) $$\frac{\lambda_{obs}}{\lambda_{orig}} = \frac{c_d}{\gamma/T_0} = \frac{(\gamma + d)^2}{\gamma^2}$$

For a red shift caused by relativistic velocities, this relation is:

(H.4) $$\frac{\lambda_{obs}}{\lambda_{orig}} = \sqrt{\frac{1+v/c}{1-v/c}}$$

implying:

(H.5) $$v/c = \frac{(\lambda_{obs}/\lambda_{orig})^2 - 1}{(\lambda_{obs}/\lambda_{orig})^2 + 1}$$

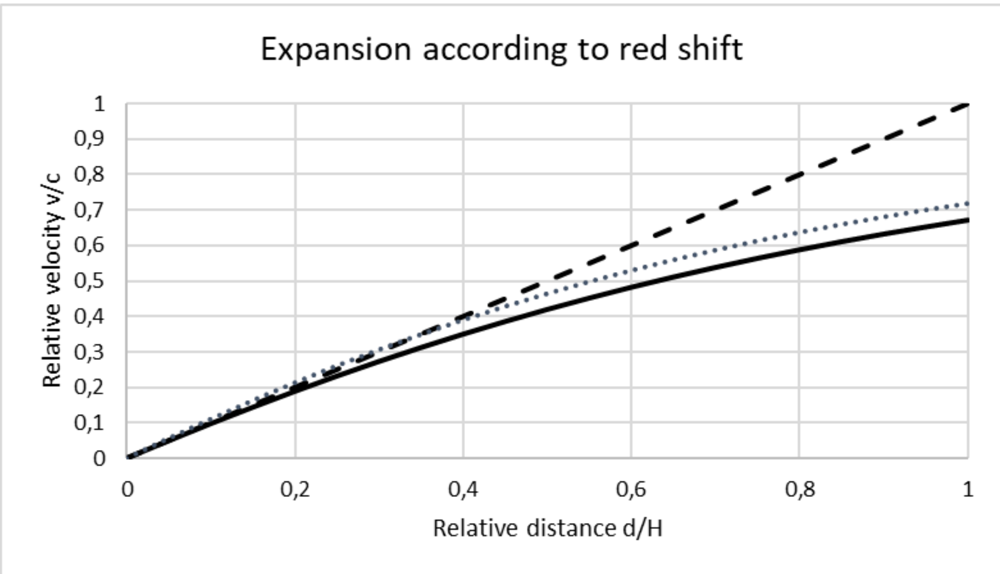
Now substituting the current attempt, equation (H.3):

(H.6) $$v_{app}/c = \frac{(\gamma + d)^4 - \gamma^4}{(\gamma + d)^4 + \gamma^4}$$

we find an 'apparent' velocity v_{app} that seems to be there but is only due to the light's behaviour – no actual velocity involved. For small distances, this comes down to:

(H.7) $$v_{app}/c \approx 1 + 2d/\gamma$$

so that, in this approach, γ would be twice the Hubble distance H. In the figure, the relation according to equation (H.6) is represented as a solid line and compared with Hubble's original assumption of a linear relationship with d as a dashed line. However, for comparison, also a dotted line is added, for $\gamma = 1.75$ H.



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