Entire Universe has been Expanding at the Speed of Light / Comprehensive Study of the Hubble Constant throughout the Ages of the Universe

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Abstract:

Our entire universe is found to be inflating exactly at the speed of light, warranting renewed thinking about the true nature of dark energy, dark matter and topology of the universe. In this research, how the values of the Hubble Constant changed along the time axis is discussed.

Introduction:

A deep analysis into the Hubble Constant reveals that the entire universe is expanding at the speed of light. Cosmological observations of celestial redshift Z values also support the same conjecture. With the special relativity notion that no object can be propelled to the speed of light, it is reasonable to infer that the universe's expansion is in fact an electromagnetic phenomenon, rather than mechanically driven by dark energy.

Main Text:

The Hubble constant appears to be a self-contained number at first. The value of about 70 km/s/mpc represents the current expansion speed of the Cosmos. If we extend calculations with the current Hubble Constant value and the estimated age of the universe, it turns out that the entire universe is growing at a rate that is exactly the speed of light. With this finding, we surmise that the Hubble constant and the cosmic expansion are closely related to the speed of light.

Universe is expanding at the speed of light

Scientists now measure the Hubble constant at around 70 ±3 km/s/mpc *(1)*. This corresponds to 21.47 ± 0.92 km/s/million light years (1 mpc = 3.26 million light years).

The age of the universe is estimated at 13.8 billion years (*2*). The expansion rate of the universe is therefore calculated at 296,286 ± 12,696 km/s (i.e. in the range of 283,590 km/s to 308,982 km/s).

The speed of light in vacuum is known to be 299,792.458 km/s (*3*), corresponds to 70.82 km/s/mpc. It fits well with the measured expansion rate of the entire universe space.

In another word, Hubble constant = Speed of light / Age of the Universe
(i.e. the current Hubble constant [70 ±3 km/s/mpc] is actually the Speed of light [299,792.458 km/s] divided by the current Age of the Universe [13.8 Billion years], given that 1 mpc = 3.26 million light years.)

This suggests an alternative explanation for the expansion of the cosmos.

Looks like that the Hubble constant is not a number coming out of nowhere. It actually ties the speed of light and the age of the Universe.

Supporting Evidence:

Cosmos Red Shifts

If the entire universe has been expanding at a constant speed of light, it can be shown mathematically that the apparent speed of a celestial body, looking back in time (in % of the speed of light) as seen by an observer, must be equal to its relative distance (in % of the current distance of the universe from the big bang singularity origin). Based on this assumption, the redshift Z values are calculated in **table S1**.

All the calculations in table S1 are basing on relative scales, in terms of distances and separation speeds. The only assumption is that the entire universe has always been expanding at a constant speed of light since the infant universe.

The calculated redshift values (special relativistically adjusted) and the observation data obtained from the NASA/IPAC Extragalactic Database are displayed alongside in Figure S2.

Cosmos Red Shifts

For the last 8 billion years, the calculated redshift values demonstrate a close agreement with the observation data obtained from the NASA/IPAC Extragalactic Database (NED).

Gravitational Red Shifts

For the first 5 billion years after the big bang, the calculated redshift values (special relativistically adjusted) are showing more noticeable discrepancy with the NED observation data. The more distant the galactic objects, the bigger the discrepancies. This is explained by the dominate gravitational redshift effect when the universe was a lot smaller, due to spacetime curvature with the presence of mass and energy under the General Relativity theory.

Interpretations:

- The entire universe is inflating at the speed of light. With the special relativity's notion that no object can be propelled with finite amount of energy to the speed of light, it is not unreasonable to infer that the expansion of the entire universe is in a form of electromagnetic wave propagation.
- A renewed thinking to consider the entire universe as a gigantic block of electromagnetic energy. The difference between the mass-energy equivalence (E=MC2) of this gigantic block of electromagnetic energy and that of all celestial objects explains the mass-energy equivalence of all dark matter(s) in the universe.

Relation to the Lambda-CDM model:

The CMB recombination is predicted by the standard Lambda-CDM model to have occurred when the universe was about 380,000 years old, following the rapid inflation phase. We are able to detect CMB (electromagnetic wave) around us today because non-CMBs have been radiating concurrently with CMB at the same speed (of light) ever since.

We assume that, in contrast to the conventional Lambda-CDM model, the universe's expansion is not mechanically fueled. The notion that dark energy constantly drives things apart is put to question.

References and Notes

(1) NASA / LAMBDA Archive Team, Hubble Constant (2023). https://lambda.gsfc.nasa.gov/education/graphic_history/hubb_const.html

(2) NASA Science, Universe Older Than Previously Thought (2023). https://science.nasa.gov/science-news/science-at-nasa/2013/21mar_cmb

(3) Encyclopaedia Britannica, Speed of Light (2023). https://www.britannica.com/science/speed-of-light

Data and materials availability:

Table S1 is produced with Excel spreadsheet. It can be made available to any researcher for purposes of reproducing or extending the analysis.

Observation data in Table S3 are drawn from the NASA/IPAC Extragalactic Database (NED) at https://ned.ipac.caltech.edu/.

Supplementary Materials

Table S1:

Redshift Z value of a celestial body, calculated using apparent relative velocity to the observer, looking back in time. (Assumption: the entire universe has been expanding at a constant speed of light since the Big Bang).

Distance Ratio (Big Bang to Celestial light Source / Big Bang to Observer)	Distance Ratio (Celestial light Source to Observer / Big Bang to Observer)	**Apparent Relative Separation Velocity between light Source and Observer (V/C)	Source Freq	Relative Wave Length at Observer	Relative Freq at Observer	Lorentz gamma γ	Redshift z Classifical	Red shift z (Relativistic) formula #1	Distance (in B. LY) light has travelled from Source to Observer. Assume Universe age 13.8 Billion years	Time duration light has travelled to Observer (Billion Years)	Distance (in B LY) from Big Bang to celestial light Source. Assume Universe age 13.8 Billion years	Time duration from Big Bang to celestial light source (Billion Years)	Velocity of celestial Object (LY / Year = C)	Apparent distance (in B LY, relativistically adjusted) light has travelled from Source to Observer, Assume Universe age 13.8Billion years
RO	s=1-RO	V/C =1 - RO	fo	λ =1 / fob	f1 = fO * 1 / λ	γ = 1 /SQRT(1-(V/C)²)	(fO - fs) / fs	SQRT((1 + v/c) / (1 - v/c)) - 1	LO=13.8 * s (LO=13.8 * Tds)	TO= LO	fsO= 13.8 - LO	fST=13.8 - To	fsO / fST	13.8 * ∫ γ.ds
100.0000%	0.0000%	0.0000%	1.000	1.000	1.000	1.000	0.000	0.000	0.00	0.00	13.80	13.80	1.00	0.00
90.4980%	9.5020%	9.5020%	1.000	1.105	0.905	1.005	0.105	0.100	1.31	1.31	12.49	12.49	1.00	1.31
78.0450%	21.9550%	21.9550%	1.000	1.281	0.780	1.025	0.281	0.250	3.03	3.03	10.77	10.77	1.00	3.05
61.5380%	38.4620%	38.4620%	1.000	1.625	0.615	1.083	0.625	0.500	5.31	5.31	8.49	8.49	1.00	5.45
46.0000%	54.0000%	54.0000%	1.000	2.000	0.460	1.250	1.000	1.000	8.38	8.38	5.42	5.42	1.00	8.88
20.0000%	80.0000%	80.0000%	1.000	5.000	0.200	1.667	4.000	2.000	11.04	11.04	2.76	2.76	1.00	12.80
11.7647%	88.2353%	88.2353%	1.000	8.500	0.118	2.125	7.500	3.000	12.18	12.18	1.62	1.62	1.00	14.92
7.6923%	92.3077%	92.3077%	1.000	13.000	0.077	2.600	12.000	4.000	12.74	12.74	1.06	1.06	1.00	16.28
5.4054%	94.5946%	94.5946%	1.000	18.500	0.054	3.083	17.500	5.000	13.05	13.05	0.75	0.75	1.00	17.12
4.0000%	96.0000%	96.0000%	1.000	25.000	0.040	3.571	24.000	6.000	13.25	13.25	0.55	0.55	1.00	17.76
3.0769%	96.9231%	96.9231%	1.000	32.500	0.031	4.063	31.500	7.000	13.38	13.38	0.42	0.42	1.00	18.24
2.4390%	97.5610%	97.5610%	1.000	41.000	0.024	4.556	40.000	8.000	13.46	13.46	0.34	0.34	1.00	18.62
1.9802%	98.0198%	98.0198%	1.000	50.500	0.020	5.050	49.500	9.000	13.53	13.53	0.27	0.27	1.00	18.98
1.6393%	98.3607%	98.3607%	1.000	61.000	0.016	5.545	60.000	10.000	13.57	13.57	0.23	0.23	1.00	19.17
0.0002%	99.9998%	99.9998%	1.000	501000.749	0.000	501.500	500999.749	1000.000	13.80	13.80	0.00	0.00	1.00	21.65

** Apparent Separation Velocity (V-app)

=	(Δb / T1) = (V1 * T1 - V0 * T0) / T1	Δb = D1 - D0 = distance between the Celestial Light Source to Observer
=	V1 - (V0 * T0 / T1)	T0 = Time duration the Celestial Light Source moved since the Big Bang
		T1 = Time duration the Observer moved since the Big Bang
		V0 = average velocity the Celestial Light Source travelled since the Big Bang
		V1 = average velocity the Observer traveled since the Big Bang
V-app / C =	(V1 - (V0 * T0 / T1)) / C	
=	1 - [(V0 * T0) / (C * T1)]	If V1 = C
=	1 - D0 / D1	

Figure S2:

Theoretical redshift (Z) values are plotted alongside the NED (NASA/IPAC Extragalactic Database) observations across various epochs of the universe.

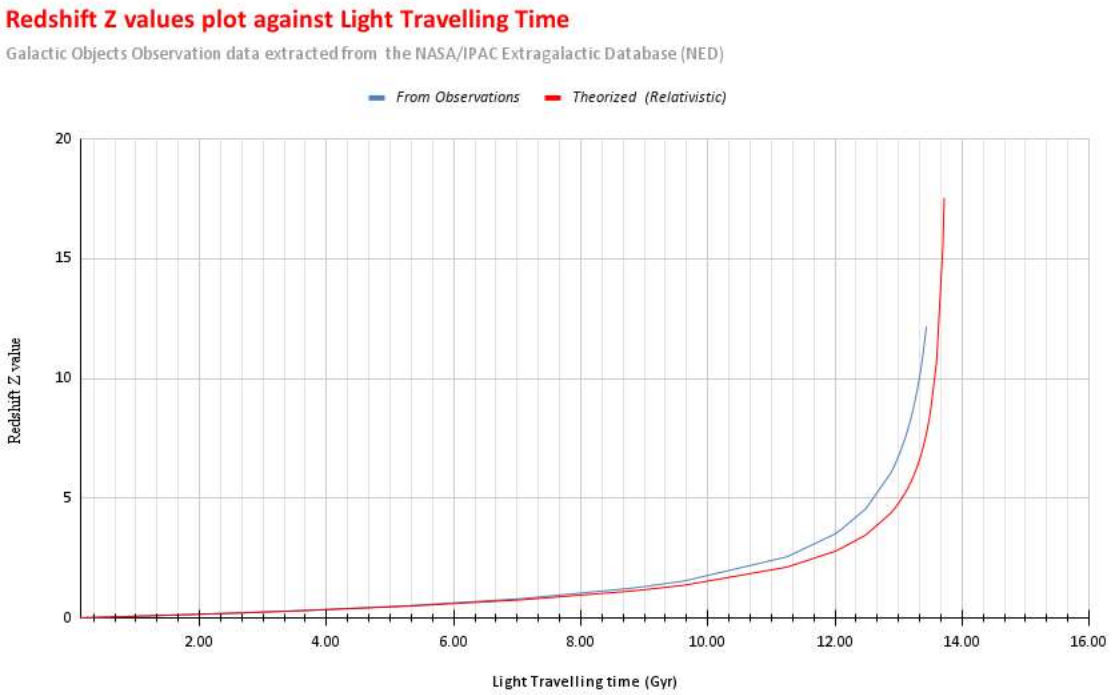

Table S3:

Chart in figure 2 above is produced with the below data. Observation data are drawn from the NASA/IPAC Extragalactic Database (NED) at https://ned.ipac.caltech.edu/. Theorized Z numbers are computed using Table S1 spreadsheet.

Celestrial Object	Observed Redshift Z (from NED)	Theorized Redshift Z (Special Relativistically adjusted)	Light Travelling time (Gyr) from Object
NGC 7820	0.01	0.009	0.13
ESO 293- G 027	0.01	0.010	0.14
2MASS J00000158-3930463	0.01	0.010	0.14
2MASX J00075083+3259427	0.05	0.052	0.69
MRSS 349-067222	0.05	0.052	0.70
WISEA J000032.52-355357.8	0.05	0.052	0.70
NSC J000127+054957	0.10	0.102	1.33
WISEA J000041.79-273626.7	0.10	0.103	1.34
LCRS B235850.3-451904	0.10	0.103	1.35
WISEA J001007.77-040717.5	0.21	0.212	2.62
WISEA J000216.41-255341.5	0.21	0.212	2.62
WHL J021241.3-183219	0.21	0.212	2.62
WHL J000352.5+284308	0.31	0.308	3.62
WISEA J001401.48+033532.2	0.31	0.308	3.62
RM J011131.8+083542.6	0.31	0.308	3.62
WISEA J000137.20+053741.0	0.51	0.494	5.26
SDSS J001332.04-074601.1	0.51	0.494	5.26
WHL J004025.9+384341	0.51	0.495	5.27
WISEA J001154.26+010252.8	0.81	0.762	7.07
2XLSSd J021641.0-061418	0.81	0.762	7.08
DEEP2 42035712	0.81	0.762	7.08
XMS J010324.6-065537	1.25	1.132	8.82
SDSS J000526.55+215237.4	1.25	1.133	8.83
2XMM J021810.8-045356	1.25	1.133	8.83
4C -02.01	1.54	1.365	9.61
SDSS J000028.14+355216.3	1.55	1.369	9.63
[YWF2017] J000.05315-00.30131	1.55	1.372	9.64
WISEA J000001.76-072909.3	2.54	2.116	11.22
WISEA J000022.00+071715.0	2.54	2.118	11.23
WISEA J000109.93-271543.6	2.58	2.142	11.26
PSS J0003+2730 ABS01	3.51	2.786	12.00
SDSS J000002.27-085640.9	3.52	2.789	12.00
LURGS J000104.2-354123	3.60	2.846	12.05
SDSS J001153.26+143444.9	4.54	3.451	12.47
WISEA J000314.99-000018.2	4.55	3.460	12.48
SDSS J000452.11+152320.4	4.59	3.483	12.49
WISEA J001411.00+010046.3	4.59	3.483	12.49
SDSS J000014.85+140159.3	4.60	3.489	12.50

ABELL 2744:[MAC2016] PAR001163	6.04	4.367	12.87
WISEA J000436.64+305758.6	6.07	4.385	12.88
PSO J002.3786+32.8702	6.10	4.406	12.89
SDSS J000037.57+243145.6	6.39	4.579	12.94
SDSS J000241.23+082348.7	6.59	4.693	12.97
WISEA J000105.09+293224.5	7.01	4.935	13.04
SDSS J001138.38+120344.4	7.01	4.935	13.04
ABELL 2744_z7_000671	7.46	5.190	13.10
HRG14 J001355.12-302158.8	7.76	5.359	13.13
ABELL 2744:[ARK2014] 2070	7.87	5.419	13.15
HRG14 J033222.39-274835.6	8.10	5.548	13.17
[MMD2016] A209-09-1	8.40	5.714	13.20
[GGF2013] 35434	8.60	5.825	13.22
[RMT2022] 0037-3337_0563	8.76	5.911	13.23
ABELL 2744:[IKO2015] HFF1P-YJ3	8.89	5.981	13.25
[PCB2012] 3020	9.11	6.099	13.26
UDF12 41067304	9.50	6.310	13.29
[GGF2013] 19776	9.54	6.332	13.30
ABELL 2744:[LBD2014] 19.2	9.83	6.485	13.32
[JDL2018] 85005338	10.00	6.573	13.33
S-CANDELS J021734.25-051536.2	10.03	6.589	13.33
MACS J0416-2403:[IZL2015] 8958	10.11	6.631	13.33
[RMT2022] 1437+5043_0259	10.56	6.866	13.36
ABELL 2744:[ZZB2014] JD1C	11.11	7.154	13.39
MACS J0647.7+7015:[CCS2013]JD1	11.20	7.194	13.40
[RMT2022] 1142+2647_1280	12.16	7.686	13.44
[RMT2022] 1237+2544_0806	12.16	7.686	13.44
Th2	n.a.	8.539	13.50
Th3	n.a.	10.705	13.60
Th4	n.a.	15.583	13.70
Th5	n.a.	17.547	13.72