

Table A.1:

N ^o	Year	H_0 [km s ⁻¹ Mpc ⁻¹]	Methods	Authors	Ref.
1	2003	72.00 ± 5.00	WMAP1	Spergel et al.	[14]
2	2007	73.20 ^{+3.1} _{-3.2}	WMAP3	Spergel et al.	[15]
3	2009	71.90 ^{+2.6} _{-2.7}	WMAP5	Hinshaw et al.	[16]
4	2011	70.40 ± 2.50	WMAP7	Komatsu et al.	[17]
5	2013	69.32 ± 0.80	WMAP9	Bennett et al.	[18]
6	2014	67.30 ± 1.20	Planck13	Ade et al.	[19]
7	2016	67.80 ± 0.90	Planck15	Ade et al.	[20]
8	2018	67.36 ± 0.54	Planck18	Aghanim et al.	[2]
9	2020	67.60 ± 1.10	ACT20	Aiola et al.	[21]
10	2001	72.00 ± 8.00	HST Key Project	Freedman et al.	[22]
11	2009	74.20 ± 3.60	Cepheids+SNe Ia	Macri et al.	[23]
12	2011	73.08 ± 2.40	Cepheids+SNe Ia	Riess et al.	[24]
13	2012	74.30 ± 2.10	CHP12	Freedman et al.	[25]
14	2016	73.24 ± 1.74	Cepheids+SNe Ia	Riess et al.	[26]
15	2018	73.48 ± 1.66	Cepheids+SNe Ia	Riess et al.	[27]
16	2019	74.03 ± 1.42	Cepheids+SNe Ia	Riess et al.	[28]
17	2021	73.20 ± 1.30	Cepheids+SNe Ia	Riess et al.	[29]
18	2022	73.04 ± 1.04	Cepheids+SNe Ia	Riess et al.	[6]

Table A.2:

N ^o	Year	H_0 [km s ⁻¹ Mpc ⁻¹]	Methods	Authors	Ref.
1	2020	67.27 ± 0.60	Planck18	Aghanim et al.	[2]
2	2020	73.50 ± 5.30	lens	Baxter et al.	[30]
3	2020	67.36 ± 0.54	Planck18+lens	Aghanim et al.	[2]
4	2020	67.90 ± 1.50	ACT20	Aiola et al.	[21]
5	2020	67.60 ± 1.10	ACT20+WMAP9	Aiola et al.	[21]
6	2021	68.80 ± 1.50	SPT18	Dutcher et al.	[31]
7	2021	67.49 ± 0.53	Planck18+SPT18+ACT20	Balkenhol et al.	[32]
8	2020	68.50 ± 2.20	BOSS DDR12+BBN	D’Amico et al.	[33]
9	2020	67.90 ± 1.10	BOSS+BBN	Ivanov et al.	[34]
10	2020	69.60 ± 1.80	eBOSS+Planck18	Pogosian et al.	[35]
11	2021	67.35 ± 0.97	BOSS+eBOSS+BBN	Alam et al.	[36]
12	2021	$65.6^{+3.4}_{-5.5}$	BOSS DR12+BAO	Philcox et al.	[37]
13	2021	$70.6^{+3.7}_{-5.0}$	BOSS DR12+BAO+lens	Philcox et al.	[37]
14	2022	$69.6^{+4.1}_{-5.4}$	BOSS+BBN	Philcox et al.	[38]
15	2022	$65.0^{+3.9}_{-4.3}$	BOSS+BBN+lens	Philcox et al.	[38]
16	2023	67.65 ± 0.44	Planck18+BAO	Bernui et al.	[39]
17	2023	67.60 ± 0.43	Planck18+BAO+lens	Bernui et al.	[39]
18	2024	68.30 ± 1.10	ACT20+BAO+BBN	Madhavacheril et al.	[40]
19	2024	68.10 ± 1.00	ACT20+BAO+BBN+Planck18	Madhavacheril et al.	[40]
20	2024	68.53 ± 0.80	DESI+BBN	Adame et al.	[41]
21	2024	68.52 ± 0.62	DESI+BBN+ θ_*	Adame et al.	[41]
22	2024	67.97 ± 0.38	DESI+ACT20+Planck18+lens	Adame et al.	[41]
23	2020	75.10 ± 3.80	Tully-Fisher relation	Schombert et al.	[42]
24	2020	73.90 ± 3.00	Maser	Pesce et al.	[43]
25	2020	69.60 ± 2.50	TRGB+SNe Ia	Freedman et al.	[44]
26	2020	74.20 ± 1.60	Gravitational lens	Millon et al.	[45]
27	2020	$75.8^{+5.2}_{-4.9}$	SNe II	de Jaeger et al.	[46]
28	2021	72.10 ± 2.00	TRGB+SNe Ia	Soltis et al.	[47]
29	2021	71.50 ± 1.80	TRGB+SNe Ia	Anand et al.	[48]
30	2021	$68.0^{+12.0}_{-8.0}$	GWTC-3	Abbott et al.	[49]
31	2021	73.60 ± 1.70	Gravitational lens	Qi et al.	[50]
32	2021	70.50 ± 5.75	SBF+SNe Ia	Khetan et al.	[4]
33	2021	73.30 ± 3.10	SBF+SNe Ia	Blakeslee et al.	[51]
34	2021	74.30 ± 1.45	Cepheids+SNe Ia	Camarena and Marra	[52]
35	2021	73.20 ± 1.30	Cepheids+SNe Ia	Riess et al.	[29]
36	2022	73.04 ± 1.04	Cepheids+SNe Ia	Riess et al.	[6]
37	2022	72.53 ± 0.99	Cepheids+TRGB+SNe Ia	Riess et al.	[6]
38	2022	73.20 ± 1.30	Cepheids+SNe Ia	Mörtsell et al.	[53]
39	2022	76.70 ± 2.00	Cepheids	Mörtsell et al.	[53]
40	2022	76.94 ± 6.40	TRGB+SNe Ia	Dhawan et al.	[54]
41	2022	$75.4^{+3.8}_{-3.7}$	SNe II	de Jaeger et al.	[55]
42	2022	62.30 ± 9.10	FRB	Hagstotz et al.	[56]
43	2022	75.50 ± 2.50	Tully-Fisher relation	Kourkchi et al.	[57]
44	2022	$67.0^{+6.3}_{-3.8}$	GW170817+GWTC-3	Mukherjee et al.	[58]
45	2023	71.00 ± 3.00	FRB	Liu et al.	[59]
46	2023	74.60 ± 0.80	Tully-Fisher relation	Tully et al.	[60]
47	2023	74.20 ± 1.60	Quasar lens	Shajib et al.	[61]
48	2024	72.37 ± 2.97	Miras-SNe Ia	Huang et al.	[62]

Bibliography

- [1] R. Rosenfeld. A cosmologia. *Física na Escola*, 6:31–37, 2005.
- [2] N. Aghanim and other. Planck2018 results: Vi. cosmological parameters. *Astronomy & Astrophysics*, 641:A6, 2020.
- [3] E. Hubble. A relation between distance and radial velocity among extra-galactic nebulae. *Proceedings of the National Academy of Science*, 15:168–173, 1929.
- [4] N. Khetan et al. A new measurement of the hubble constant using type ia supernovae calibrated with surface brightness fluctuations. *Astronomy & Astrophysics*, 647:A72, 2021.
- [5] E. Di Valentino. A combined analysis of the h0 late time direct measurements and the impact on the dark energy sector. *Monthly Notices of the Royal Astronomical Society*, 502:2065–2073, 2021.
- [6] A. G. Riess et al. A comprehensive measurement of the local value of the hubble constant with $1 \text{ km s}^{-1} \text{ Mpc}^{-1}$ uncertainty from the hubble space telescope and the sh0es team. *The Astrophysical Journal Letters*, 934:L7, 2022.
- [7] M. López-Corredoira B. Wang and J. Wei. The hubble tension survey: A statistical analysis of the 2012–2022 measurements. *Monthly Notices of the Royal Astronomical Society*, page 7692–7700, 2024.
- [8] B. Pritychenko. A nuclear data approach for the hubble constant measurements, 2015.
- [9] R. B. Tully. The hubble constant: A historical review, 2023.
- [10] E. Di Valentino et al. In the realm of the hubble tension — a review of solutions. *Classical and Quantum Gravity*, 38:153001, 2021.
- [11] E. Abdalla et al. Cosmology intertwined: A review of the particle physics, astrophysics, and cosmology associated with the cosmological tensions and anomalies. *Journal of High Energy Astrophysics*, 34:49–211, 2022.

- [12] L. Perivolaropoulos and F. Skara. Challenges for λ cdm: An update. *New Astronomy Reviews*, 95:101659, 2022.
- [13] J. Hu and F. Wang. Hubble tension: The evidence of new physics. *Universe*, 9:94, 2023.
- [14] D. N. Spergel et al. First-year wilkinson microwave anisotropy probe (wmap) observations: Determination of cosmological parameters. *The Astrophysical Journal Supplement Series*, 148:175–194, 2003.
- [15] D. N. Spergel et al. Wilkinson microwave anisotropy probe (wmap) three year results: implications for cosmology. *The Astrophysical Journal Supplement Series*, 170:377, 2007.
- [16] G. Hinshaw et al. Five-year wilkinson microwave anisotropy probe (wmap) observations: Data processing, sky maps, and basic results. *The Astrophysical Journal Supplement Series*, 180:225–245, 2009.
- [17] E. Komatsu et al. Seven-year wilkinson microwave anisotropy probe (wmap) observations: Cosmological interpretation. *The Astrophysical Journal Supplement Series*, 192:18, 2011.
- [18] C. L. Bennett et al. Nine-year wilkinson microwave anisotropy probe (wmap) observations: Final maps and results. *The Astrophysical Journal Supplement Series*, page 20, 2013.
- [19] P. A. R. Ade et al. Planck2013 results. xvi. cosmological parameters. *Astronomy & Astrophysics*, 571:A16, 2014.
- [20] P. A. R. Ade et al. Planck2015 results: Xiii. cosmological parameters. *Astronomy & Astrophysics*, 594:A13, 2016.
- [21] S. Aiola et al. The atacama cosmology telescope: Dr4 maps and cosmological parameters. *Journal of Cosmology and Astroparticle Physics*, 2020:047–047, 2020.
- [22] W. L. Freedman et al. Final results from the hubble space telescope key project to measure the hubble constant. *The Astrophysical Journal*, 553:47–72, 2001.
- [23] L. M. Macri et al. The sh0es project: Observations of cepheids in ngc 4258 and type ia sn hosts. In Joyce Ann Guzik and Paul A. Bradley, editors, *Stellar Pulsation: Challenges for Theory and Observation*, volume 1170 of *American Institute of Physics Conference Series*, pages 23–25. AIP, 2009.

- [24] A. G. Riess et al. A 3% solution: Determination of the hubble constant with the hubble space telescope and wide field camera 3. *The Astrophysical Journal*, 730:119, 2011.
- [25] W. L. Freedman et al. Carnegie hubble program: A mid-infrared calibration of the hubble constant. *The Astrophysical Journal*, 758:24, 2012.
- [26] A. G. Riess et al. A 2.4% determination of the local value of the hubble constant. *The Astrophysical Journal*, 826:56, 2016.
- [27] A. G. Riess et al. New parallaxes of galactic cepheids from spatially scanning the hubble space telescope: Implications for the hubble constant. *The Astrophysical Journal*, 855:136, 2018.
- [28] A. G. Riess et al. Large magellanic cloud cepheid standards provide a 1% foundation for the determination of the hubble constant and stronger evidence for physics beyond λ cdm. *The Astrophysical Journal*, 876:85, 2019.
- [29] A. G. Riess et al. Cosmic distances calibrated to 1% precision with gaiaedr3 parallaxes and hubble space telescope photometry of 75 milky way cepheids confirm tension with λ cdm. *The Astrophysical Journal Letters*, 908:L6, 2021.
- [30] E. J. Baxter et al. Determining the hubble constant without the sound horizon scale: measurements from cmb lensing. *Monthly Notices of the Royal Astronomical Society*, 501:1823–1835, 2020.
- [31] D. Dutcher et al. Measurements of the e-mode polarization and temperature-e-mode correlation of the cmb from spt-3g 2018 data. *Physical Review D*, 104:022003, 2021.
- [32] L. Balkenhol et al. Constraints on λ cdm extensions from the spt-3g 2018 ee and te power spectra. *Physical Review D*, 104:083509, 2021.
- [33] G. D’Amico et al. The cosmological analysis of the sdss/boss data from the effective field theory of large-scale structure. *Journal of Cosmology and Astroparticle Physics*, 2020:005–005, 2020.
- [34] M. Simonović M. M. Ivanov and M. Zaldarriaga. Cosmological parameters from the boss galaxy power spectrum. *Journal of Cosmology and Astroparticle Physics*, 2020:042–042, 2020.
- [35] G. Zhao L. Pogosian and K. Jedamzik. Recombination-independent determination of the sound horizon and the hubble constant from bao. *The Astrophysical Journal Letters*, 904:L17, 2020.

- [36] S. Alam et al. Completed sdss-iv extended baryon oscillation spectroscopic survey: Cosmological implications from two decades of spectroscopic surveys at the apache point observatory. *Physical Review D*, 103:083533, 2021.
- [37] O. H. E. Philcox et al. Determining the hubble constant without the sound horizon: Measurements from galaxy surveys. *Physical Review D*, 103:023538, 2021.
- [38] O. H. E. Philcox et al. Determining the hubble constant without the sound horizon: A 3.6% constraint on h_0 from galaxy surveys, cmb lensing, and supernovae. *Physical Review D*, 106:063530, 2022.
- [39] A. Bernui et al. Exploring the h_0 tension and the evidence for dark sector interactions from 2d bao measurements. *Physical Review D*, 107:103531, 2023.
- [40] M. Madhavacheril et al. The atacama cosmology telescope: Dr6 gravitational lensing map and cosmological parameters. *The Astrophysical Journal*, 962:113, 2024.
- [41] A. G. Adame et al. Desi 2024 vi: Cosmological constraints from the measurements of baryon acoustic oscillations, 2024.
- [42] S. McGaugh J. Schombert and F. Lelli. Using the baryonic tully–fisher relation to measure h_0 . *The Astronomical Journal*, 160:71, 2020.
- [43] D. W. Pesce et al. The megamaser cosmology project. xiii. combined hubble constant constraints. *The Astrophysical Journal Letters*, 891:L1, 2020.
- [44] W. L. Freedman et al. Calibration of the tip of the red giant branch. *The Astrophysical Journal*, 891:57, 2020.
- [45] M. Millon et al. Tdcosmo: I. an exploration of systematic uncertainties in the inference of h_0 from time-delay cosmography. *Astronomy & Astrophysics*, 639:A101, 2020.
- [46] T. de Jaeger et al. A measurement of the hubble constant from type ii supernovae. *Monthly Notices of the Royal Astronomical Society*, 496:3402–3411, 2020.
- [47] S. Casertano J. Soltis and A. G. Riess. The parallax of ω centauri measured from gaia edr3 and a direct, geometric calibration of the tip of the red giant branch and the hubble constant. *The Astrophysical Journal Letters*, 908:L5, 2021.

- [48] G. S. Anand et al. Comparing tip of the red giant branch distance scales: An independent reduction of the carnegie-chicago hubble program and the value of the hubble constant. *The Astrophysical Journal*, 932:15, 2022.
- [49] R. Abbott et al. Constraints on the cosmic expansion history from gwtc-3. *The Astrophysical Journal*, 949:76, 2023.
- [50] J. Qi et al. Measurements of the hubble constant and cosmic curvature with quasars: ultracompact radio structure and strong gravitational lensing. *Monthly Notices of the Royal Astronomical Society*, 503:2179–2186, 2021.
- [51] J. P. Blakeslee et al. The hubble constant from infrared surface brightness fluctuation distances*. *The Astrophysical Journal*, 911:65, 2021.
- [52] D. Camarena and V. Marra. On the use of the local prior on the absolute magnitude of type ia supernovae in cosmological inference. *Monthly Notices of the Royal Astronomical Society*, 504:5164–5171, 2021.
- [53] J. Johansson E. Mörtzell, A. Goobar and S. Dhawan. Sensitivity of the hubble constant determination to cepheid calibration. *The Astrophysical Journal*, 933:212, 2022.
- [54] S. Dhawan et al. A uniform type ia supernova distance ladder with the zwicky transient facility: Absolute calibration based on the tip of the red giant branch method. *The Astrophysical Journal*, 934:185, 2022.
- [55] T. de Jaeger et al. A 5% measurement of the hubble–lemaître constant from type ii supernovae. *Monthly Notices of the Royal Astronomical Society*, 514:4620–4628, 2022.
- [56] R. Reischke S. Hagstotz and R. Lilow. A new measurement of the hubble constant using fast radio bursts. *Monthly Notices of the Royal Astronomical Society*, 511:662–667, 2022.
- [57] E. Kourkchi et al. Cosmicflows-4: the baryonic tully–fisher relation providing $\sim 10,000$ distances. *Monthly Notices of the Royal Astronomical Society*, 511:6160–6178, 2022.
- [58] S. Mukherjee et al., 2022.
- [59] H. Yu Y. Liu and P. Wu. Cosmological-model-independent determination of hubble constant from fast radio bursts and hubble parameter measurements. *The Astrophysical Journal Letters*, 946:L49, 2023.
- [60] R. B. Tully et al. Cosmicflows-4. *The Astrophysical Journal*, 944:94, 2023.

- [61] A. J. Shajib et al. Tdcosmo: Xii. improved hubble constant measurement from lensing time delays using spatially resolved stellar kinematics of the lens galaxy. *Astronomy & Astrophysics*, 673:A9, 2023.
- [62] C. D. Huang et al. The mira distance to m101 and a 4% measurement of h_0 . *The Astrophysical Journal*, 963:83, 2024.