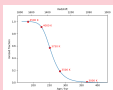


Timeline

Time after Big Bang	T / K	Color of Universe	Energy of radiation	Size of observable Universe at t (dp).	Radius of today's obs. Uni.	H(t) / km s <sup>−1</sup> Mpc <sup>−1</sup>	Density / g cm <sup>−3</sup>	Epoch	Event	Scale factor a	Redshift z	Photon density / cm <sup>−3</sup>	Photon mean free path	Photon pressure / atm	
<1e-43 s	1e32	<div></div>	1e16 TeV					Planck epoch	Gravity separates			No photons			
<1e-36 s		<div></div>						Grand Unification Epoch	X and Y bosons allow early matter to fluctuate between baryon and lepton states						
1e-36 s	1e27/8	<div></div>	1e11/12 TeV		1e-23 cm			Inflation	Strong force separates. X and Y bosons decay to e.g. W, Z and Higgs bosons.						
1e-32/3	1e22	<div></div>	1e6 TeV	1e-32 cm	10 m	1e51	1e70		Inflation ends	2e-26	5e25	5e79	Electrons and positrons have n't yet annihilated, so much smaller		
1e-12 s	1e16	<div></div>	1 TeV	5 Å	0.6 AU	1e31	1e30	Quark epoch	Weak force and EM force separates. Matter particles acquire mass.	2e-16	5e15	5e49			
1.7e-9	3e14	<div></div>	28 GeV	5 μm	24 AU	1 c / m	6e23			8e-15	1e14	7e23		1e35	
1e-6 s	1e13	<div></div>	1 GeV	1 cm	600 AU	1e25	9e17	Hadron epoch	Quarks form hadrons	2e-13	5e12	5e40		3e29	
1 s	1e10	<div></div>	1 MeV	500 km	10 lyr	1e19	9e5	Lepton epoch	Hadrons and antihadrons annihilate. Neutrinos decouple	2e-10	5e9	5e31		3e17	
10 s	4e9	<div></div>	0.4 MeV	8000 km	10 pc	1e18	1 kg/cm <sup>3</sup>	Photon epoch	Leptons and antileptons annihilate.	6e-10	2e9	2e30	20 m	3e15	
3 min	1e9	<div></div>	100 keV	1 ls	40 pc	9e16	28		Nucleosynthesis begins	3e-9	4e8	2e28	~1 km	1e13	
15 min	4e8	<div></div>	40 keV	2e6 km	90 pc	2e16	1		Nucleosynthesis ends	6e-9	2e8	2e27	16 km	4e11	
1 yr	2e6	<div></div>	200 eV	7000 AU	16 kpc	5e11	9e-10			1e-6	9e5	3e20	0.7 AU	300	
18 yr	6e5	<div></div>	50 eV	1 pc	70 kpc	3e10	3e-12			5e-6	2e5	4e18	50 AU	1	
52 kyr	9200	<div></div>	0.8 eV	32 kpc	4.2 Mpc	1e7	2e-19	Matter epoch begins	Radiation-matter equality	3e-4	3371	2e13	60 pc	7e-8	
~100 kyr	6000	<div></div>	0.5 eV	~75 kpc	6 Mpc	5e6	5e-20		Universe glows white	5e-4	~2200	5e12	200 pc	1e-8	
~200 kyr	~4500	<div></div>	0.4 eV	140 kpc	9 Mpc	3e6	2e-20	Recombination epoch 	Ionized fraction begins to drop	6e-4	~1600		600 pc		
372 kyr	2980	<div></div>	0.25 eV	260 kpc	13 Mpc	1.5e6	4.5e-21			9e-4	1090	5e11	390 kpc		
379 kyr	2940	<div></div>		270 kpc					Decoupling (mfp ~ 2r <sub>hor</sub> )		1079		540 kpc		
1 Myr	1614	<div></div>	0.14 eV	730 kpc	24 Mpc	6e5	7e-22	"Visibility epoch" (Andersen+ 2018)	Universe becomes fainter than the Sun viewed from Earth	2e-3	600	9e10	650 Gpc	7e-11	
5.5 Myr	559	<div></div>	50 meV	4 Mpc	70 Mpc	1e5	2e-23		Universe becomes fainter than a candle at 2.6 km.	5e-3	200	4e9	1e4 Gpc		
10 Myr	380	<div></div>	33 meV	8 Mpc	100 Mpc	63e3	8e-24	Dark Ages		7e-3	140	1e9	1e7 Gpc		
15 Myr	20 °C	<div></div>	25 meV	12 Mpc	130 Mpc	42e3	3e-24			9e-3	110	5e8			
17 Myr	0 °C	<div></div>	23meV	14 Mpc	140 Mpc	38e3	3e-24			0.01	100	4e8			
~100 Myr	~100	<div></div>	7 meV	~100 Mpc	~500 Mpc	6500	5e-16		Gravitational collapse	0.03	30	1e7			
180 Myr	57	Star formation shifts the color from being temperature-dominated to being dominated by stars	5 meV	150 Mpc	700 Mpc	3600	2e-26	Epoch of Reionization	First stars form	0.05	20	4e6			
410 Myr	33		3 meV	350 Mpc	1.2 Gpc	1600	5e-27		Most distant, spectroscopically confirmed, galaxy: GN-z11	0.08	11.09	7e5	1e10 Gpc		
562 Gyr	27		2 meV	500 Mpc	1.5 Gpc	1200	3e-27	Galaxy epoch begins	Planck-inferred z <sub>re</sub> Ultra-VISTA LAEs	0.1	8.8	4e5			
~1 Gyr	~20		~1 meV	~1 Gpc	~2 Gpc	~650	~1e-27		Gunn-Peterson trough disappears	~0.15	~5.7	~1e5			
10.2 Gyr	3.5			0.3 meV	10 Gpc	11 Gpc	80	1e-29	Dark energy epoch	Matter-dark energy equality	0.76	0.3	920		
13.8 Gyr	2.725	<div></div> <a href="#">Cosmic lattice</a>	0.2 meV	14.2 Gpc 46.3 Gly		67.81	8.6e-30	Today		1	0	411	2e13 Gpc	5.5e-22	