

The style guide: status, issues, and plans

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Legacy Book General Editor / Belle / University of Sydney High Energy Physics group

B-Factories' Physics Legacy Book Meeting, 30th October 2009



Outline

- 1 Our aspirations
- 2 How this will play out
- 3 Symbols file, and the common naming scheme
- 4 Default look-and-feel
- 5 Citations
- 6 Cross-references
- 7 Example of \LaTeX source for a section
- 8 \LaTeX driver, figure formats, ...
- 9 Level; choice of tense; theoretical issues
- 10 The coin toss



Our aspirations



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 - and \lesssim 10 small, standard files,
 - and get the close-to-final look-and-feel



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 - 2 $\{\beta, \alpha, \gamma, (S, A), M_{bc}\}$
- let us stop here for feedback before moving on ...



Cosmic microwave background and first molecules in the early universe

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Abstract Besides the Hubble expansion of the universe, the main evidence in favor of the big-bang theory was the discovery, by Penzias and Wilson, of the cosmic microwave background (hereafter CMB) radiation. In 1990, the COBE satellite (Cosmic Background Explorer) revealed an accurate black-body behavior with a temperature around 2.7 K. Although the microwave background is very smooth, the COBE satellite did detect small variations—at the level of one part in 100 000—in the temperature of the CMB from place to place in the sky. These ripples are caused by acoustic oscillations in the primordial plasma. While COBE

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Table 1.1 Orders of magnitude of important epochs in the history of the universe, according to the Λ CDM model

Epoch	Time	Temperature	Redshift	Physics
Planck epoch	10^{-43} s	10^{19} GeV	10^{32}	limit of spacetime
Cosmic inflation	10^{-32} s	10^{16} GeV	10^{29}	unstable vacuum
Creation of light	10^{-26} s	10^{14} GeV	10^{27}	conversion of vacuum to radiation energy
Electroweak epoch	10^{-10} s	100 GeV	10^{15}	electroweak unification
The strong epoch	10^{-4} s	200 MeV	2×10^{12}	quark–hadron transition
Weak decoupling	1 s	1 MeV	10^{12}	neutrinos decouple
e^+e^- annihilation	5 s	0.5 MeV	5×10^9	electron heat dumped into photons
Nucleosynthesis	100 s	100 keV	10^9	nuclei formation
Spectral decoupling	1 month	500 eV	10^6	end of efficient photon production
Matter/radiation equality	10 000 years	10 000 K	3 300	matter dominates mass density
Last scattering epoch	0.3 My	3 000 K	1 000	universe transparent to light
Molecular epoch	15 My	1 500 K	500	formation of molecules
Dark ages	1 Gy	20 K	65	first small objects coalesce
Bright ages	2–13 Gy	3–10 K	10–30	large-scale gravitational instability
Present epoch	13 Gy	2.725 K	0	new astrophysics and physics

- *The decoupling of the weak interactions* ($t \sim 1$ s, $T \sim 1$ MeV).

It follows that the neutron-to-proton ratio is fixed and that the present universe is dominated by hydrogen. The cosmic neutrinos decoupled—as well as several other possible forms of dark matter—and have their density fixed at this time.

This review summarizes the present knowledge of the CMB radiation, and some of the details of the generation of its possible distortions and anisotropies. The existence of other fossils—such as light nuclei—is also discussed with particular attention to the arrival of the first molecules in the universe. Earlier general reviews on CMB can be found in [9–10], and on primordial chemistry in [11].



In fact, there were only some traces of beryllium-9 and boron-11. The primordial nuclear reactor was short-lived.

In the framework of the SBBN model, as the temperature dropped below $T < 30$ keV, when the universe was close to 20 min old, Coulomb barriers suppressed all nuclear reactions. Afterwards, until the first stars formed, no new nuclides were created.

Before presenting the predictions of the SBBN model, let us note that the dominant product of big-bang nucleosynthesis was ^4He , and its abundance was very sensitive to the $(n/p)_{\text{nuc}}$ ratio. Introducing $n_{\text{tot}} = [n + p]_{\text{nuc}}$, the abundance of helium ^4He that forms is

$$Y(^4\text{He}) = \frac{n_{^4\text{He}}}{n_{\text{tot}}} = \frac{2(n/p)_{\text{nuc}}}{1 + (n/p)_{\text{nuc}}} \sim 0.25, \quad (3.13)$$

i.e. an abundance of ^4He close to 25% by mass. Lesser amounts of the other light elements were produced: D at the level of about 10^{-5} by number and ^7Li at the level of 10^{-10} by number.

3.1.3 Predicted abundances of light elements

In the SBBN model with $N_\nu = 3$, the only free parameter is the density of baryons, Ω_b or η , the ratio of the number of baryons n_b to the number of photons n_γ :

$$\eta = \frac{n_b}{n_\gamma} \quad (3.14)$$

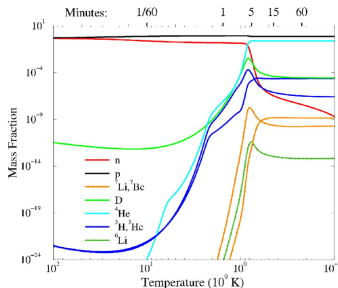


Fig. 3.2 Time-temperature evolution of the primordial nucleus in standard cosmological model (from Burles and Nollett [51]). Let us note that at very high temperatures the number of protons should be equal to the number of neutrons

The four curves of Fig. 3.3 represent the abundance ratio predicted by SBBN: the top curve is the helium-4 mass as a fraction of the mass of all baryons, while the three lower curves are the number fractions of deuterium, helium-3 and lithium-7 with regard to hydrogen.

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- the BaBar and Belle ones will double as an index showing the section where the paper is principally treated



Citations (2): Section mini-bibliography

Like the PDG end-section,

- but for B-factory papers only
- and at the *beginning* of the section

This will be a useful tool during drafting; may keep it for the final version.

AUBERT	08B	PR D77 011102R
AUBERT	08Y	PR D77 111101R
ABULENCIA	07E	PRL 98 132002
ABULENCIA	06B	PRL 96 102002
AUBERT	06	PR D73 011101R
AUBERT	06E	PRL 96 052002
AUBERT,BE	06M	PR D74 071101R
GOKHROO	06	PRL 97 162002
PDG	06	JPG 33 1



Cross-references



Example of \LaTeX source for a section



- pdflatex
- .pdf, .jpg, .png
- reasonable image quality
- we will disseminate a guide, then monitor ...



Level; choice of tense, theoretical issues

- level (for introductory (sub)sections):
Honours / start of Masters / start of grad-school
- tense: to be determined
- theoretical rules: to be determined



The coin toss

Reminder of our plan:

- use one scheme; share the pain
- we will make a fair coin toss between
 - 1 $\{\phi_1, \phi_2, \phi_3, (S, C), m_{ES}\}$
 - 2 $\{\beta, \alpha, \gamma, (S, A), M_{bc}\}$
- I will toss
- Adrian will call “heads” or “tails” for scheme 2
- we will commit to accepting the results of the analysis
- we will open the bok

Drumroll please ...



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