TDR Format Instruction

1 Title

By default, only capitalize the first letter of first word
The name should be capitalized, like “Reference Detector”

2 Unit Symbols

Please use the definitions in “cepcphysics.sty”

Use upright (non-italic) font. In equations, wrap units in \mathrm{}.
Example: 1~\GeV (correct)
Add a space between numbers and units using ~ to avoid line breaks.

Example: 1~\mm (millimeter), 5~\mum (micrometer; do not use μm).
Always use symbols (e.g., \m instead of meters, \mum instead of microns).

- Energy Units

Use \GeV, \TeV, \MeV (predefined in cepcphysics.sty). Never write them directly (e.g., GeV).

- Particle Names

Standard notation (italic uppercase):
\Hboson (Higgs), \Zboson (Z boson), \Wboson (W boson).
Other particles:
Pion: \pion, Kaon: \kaon (refer to .sty definitions).

- Variable Names

Transverse momentum: \pT,
transverse energy: \eT,
Missing transverse energy: \MET

- Glossary Terms

Always reference terms with \gls{}, e.g., \gls{TPC} (Time Projection Chamber).
Plural forms: \glspl{}, e.g., \glspl{SiPM} renders as SiPMs.

3 Figure

3.1 Multi-plots

If a figure has two or more parts, refer to it as "Figure 1(a)" and "Figure 1(b)," etc. Both "(a)" and "(b)" should appear in the text, in the figure (preferably in the top right-hand corner), and in the caption. Try to make the figures with a uniform style and size throughout the paper.

Latex example:

```
\begin{figure}[H]
    \begin{center}

\subfloat[][]{\includegraphics[width=.4\linewidth]{ *a*.pdf}\label{fig:TESTa} }
        \hspace{.015\linewidth}

\subfloat[][]{\includegraphics[width=.4\linewidth]{ *b*.pdf}\label{fig:TESTb} }
        \caption{.....}
        \label{fig:TEST}
    \end{center}
\end{figure}
```

The caption and text should not mention colors or require any color distinctions to interpret the figure (e.g., "the red curve corresponds to…"). Note that figures may be reduced in size for publication, and readers do not all have superb eyesight or excellent printers. As a guide, numbers and capital letters should be at least 2 mm high. Very thin lines may become difficult to see.

Check carefully that any labels used in figures are consistent with both the caption and the text in terms of spelling, nomenclature, etc.
A good place for figures is at the tops of pages, except when a main heading would normally be there. (In LaTeX, ensure this with \begin{figure}[t].) This also avoids having isolated text trapped above a big figure at the top of a page.

3.2 Graphs and Plots

If a figure presents data or results, the word "CEPC" (or "CEPC Preliminary" if appropriate) must appear prominently somewhere in the figure. This becomes important when later the figure is copied and/or shown out of context. All axes must be labeled, including units. Units should be given in square brackets, e.g., "Energy [GeV]." Axis labels should be big, clear, and meaningful, as well as begin with a capital letter. Axis numbers should be in a clear, standard font. On histograms, the vertical axis units should specify the bin width, unless arbitrarily normalized or the bins are variable sizes.

If different plotting symbols are used, a legend box explaining them must appear somewhere in the figure. If possible, the symbols should be listed in the order that they appear in the figure. The automatic statistics and fit results box should be omitted unless its inclusion is relevant to the discussion. However, in that case, it is better to include the relevant information, properly formatted, within the figure.

Pick solid, prominent plotting symbols to represent CEPC results when comparing to other data, and use bold lines when superimposing curves. For certain types of figures, e.g., scatter plots, it is useful to have tick marks appearing on all four sides of a figure. Include these wherever possible.

3.3 Figure Captions

Note that most of what follows is done automatically by the LaTeX \caption command. The figure caption should be below the figure. The caption begins with the words "Figure n:", where n is the figure number.

For multi-part figures, the convention "this figure shows (a) first thing, (b) second thing, …" is preferred over "this figure shows first thing (a), second thing (b), …". All variables and plotting symbols used in the figure must be defined in the caption. Define all lines used in the figure (solid, dashed, dot-dashed, dotted, etc.). If relevant, the normalization method of the plot should be specified.

4 Tables

- **Table References**: All tables must be mentioned in the text and appear in the order they are referenced, close to their first mention.
- **Format Requirements**:
  - Capitalize the first letter of row or column headings.
  - All rows and columns must be labeled, with units enclosed in brackets (e.g., "Energy [GeV]").
  - Tables need to fit between the page margins, cannot expand to the margins.
- **Alignmen**t:
  - Text entries are typically left-aligned.
  - Numerical column entries are usually central-aligned.
- **Placemen**t: Tables are typically placed at the top of pages (avoiding conflicts with main headings), implemented using LaTeX's \begin{table}[t].
-**Caption**: Table captions above the table. Caption should be detailed enough, cannot be one sentence.

Template:

```
\begin{table}[h]
\centering
\caption{Your Table Title Here.} % Replace with your table title
\label{tab:your_label_here} % Replace with your table label
\begin{adjustbox}{width=\linewidth} % Added required parameter for adjustbox
\begin{tabular}{lccc} % Left-aligned header column, centered data columns
\toprule[0.1em]   % Do not use \hline
\makecell[c]{Parameter} & \textbf{Column 1} & \textbf{Column 2} &
\textbf{Column 3} \\ % Replace with your header row, bold font
\midrule   % Do not use \hline
Row 1 & Value 1 & Value 2 & Value 3 \\ % Replace with your row data
Row 2 & Value 4 & Value 5 & Value 6 \\ % Replace with your row data
\bottomrule[0.1em]   % Do not use \hline
\end{tabular}
\end{adjustbox}
```

\end{table}

5 References

Please add new reference to the bib file in your chapter folder, like "Performance.bib" in /chap15_Performance/

- Citations should be of permanent documents, publicly available, such as journals, books, TDRs, preprints.
- If some CEPC results are not yet public, we should try to submit to the archive or publish before refereceing in the TDR. References to material that cannot be assessed by other outside the CEPC community is strongly discouraged and should only be done as a last resort.
- If at all possible, quote only paper proper publications. If you have to quote other documents, give a web address to 'permanent' storage such as arXiv or CDS.
- If citing theses, make an effort to also cite the corresponding journal paper, if available. Give a web address if the item has not been published.
- Avoid citing private references, such as private communications.
- Wherever possible, web addresses should be avoided or used in addition to other information as they are not permanent. The use of DOIs (Digital Object Identifiers) [6] promises to improve the situation.
- Wherever possible, cite an article's journal reference rather than its preprint number. If desired, the hep-ex number (or equivalent) can be given as well.
- Always double-check references when copying them from another source.

6 Chapter structure

Chapter X:	
X.1 Overview	
	Expected performance/requirements, Design overview
X.2 Detailed Design	
X.2.1 **Detailed design**	
X.2.2 Challenges and critical R&D	
X.3 Key Technologies to address challenges	
X.4 R&D and prototypes	
X.5 Simulation and Performance	
X.6 Alternative Solutions	
	Can be either backup or more advanced solution

	(demonstrate backup solutions are in hand and that their possible selection still meet the requirements)
X.7 Summary and Future Plan	
·(X.8 Cost table and justification)	
	eventually to be moved to a common chapter

Requirement:
- Sections should not have more than 4 numbered subsection levels x.y.z.w
- If using AI, editors need to read the AI output and finalize the text themselves. Do not use AI output blindly. Also, AI usage should be focused on correcting English, do NOT write full sections using AI
- Figures and Table captions should be long and describe the figure/table, as needed. They should not be just a title. Reader should be able to understand content from the figure/table and caption.
- The document should be written in American English, not British English. More instructions are given below.

7 Layout, Styles, and Typography

This section begins with the overall layout of a paper and the organization of sections and subsections, followed by an introduction to the concept of styles. It then describes some basics of typography, including a section on typing special characters. We also discuss the use of units, equations, lists, and italics.

7.1 Typography: Specific Aspects

Many of the points below, especially particle symbols and related items, are implemented for LaTeX users as an extensive list of macros in the file cepcphysics.sty [3].

RECOMMENDATION: Use the macros file cepcphysics.sty for particle symbols, variables, etc. This will ensure correctness and consistency, as well as saving you some work.

7.1.1 Numbers RECOMMENDATION:

Write out integers from one to ten. Use digits for decimals, percentages, and when there are units. Use spaces for numbers with five or more digits unless the journal insists on commas. Numbers at the beginning of a sentence should always be written out. Do not mix digits and words—use digits.

7.1.2 Variables and Symbols RECOMMENDATION:

Variables should always be written in italics, to make them easier to distinguish from the main text.

For example, use ‘x’ rather than ‘x’. In LaTeX math mode, this happens automatically. However, remember the following in order to prevent some very common errors:
- Isolated variables in the main text must be in italics—use math mode in LaTeX.
- Unit names and abbreviations should never be in italics. In LaTeX math mode, people often do not get this right; use \rm or take the units outside of math mode.
- Standard functions, such as sine and cosine, should not be in italic. Using the LaTeX macros for them (e.g., \sin) ensures that.
- Derivatives should not have the ‘d’s’ in italic, e.g., dy/dx. Note that this is British usage; American usage is to have italic ‘d’s’ (e.g., dy/dx).

Use special symbols rather than trying to substitute ordinary characters. Examples are:
- The ‘times’ symbol—$\times$ in LaTeX, e.g., 0.1 × 0.2; do not use the letter ‘x’.
- The degree symbol—$^\circ$ in LaTeX, e.g., 11 °C; do not use a superscript ‘o’. But note that kelvin does not take a degree sign, and that journals disagree about whether to put a space between the value and the degree symbol.
- The plus-or-minus symbol—$\pm$ in LaTeX, e.g., ±2 mm; do not use ‘+-’ or ‘+/-’.

A very common mistake concerns minus signs. These are not the same as hyphens but should be as long as a plus sign. (Compare x – y + z with x - y + z, –4.2 with -4.2, and 10–34 with 10-34.) Again, LaTeX math mode does it correctly, but documents and PowerPoint slides abound with anaemic-looking hyphens instead of minus signs. To fix this outside of math mode, use an en-dash rather than a hyphen; see Section 4. 1.2.
RECOMMENDATION: Do not start a sentence with a symbol—it is not good style.

There are a number of cases where there is no clear rule regarding symbols in italics, and different publishers have their own conventions. Consult the journal’s style recommendations, and if you make your own choices, then apply them consistently:
- Constants of nature (e, c, h, etc.) are usually in italics.
- Numbers such as e, π, and i are usually not in italics, because they are not variables.
- Greek-letter variables are sometimes in italics, sometimes not.
- Symbols for elementary particles are very controversial. However, almost all particle physics journals use italics, so not doing this can create extra work and problems.
RECOMMENDATION: Where macros are defined (e.g., in cepcphysics.sty), they should be used, even if simple.

7.1.3 Subscripts and Superscripts
Subscripts and superscripts should be in italics if they are variables or characters that take values, and in normal text if they simply represent words or labels.

RECOMMENDATION: If subscripts and superscripts are not variables, then do not use italics. Specific examples are pT, ET, and Tmiss.

7.1.4 Special Characters

In this section, we mention some special characters: why they are used, and how to produce them in LaTeX.

*__En-dashes and Em-dashe__s**

The usage of hyphens, and the longer versions known as en-dashes (the width of an 'N') and em-dashes (the width of an 'M') will be discussed in Sections 4.4.1, 4.4.2, and 4.3.1, respectively. Note that en-dashes, not hyphens, should be used for minus signs. To produce en-dashes and em-dashes in LaTeX, just type two consecutive hyphens (--) for an en-dash and three hyphens (---) for an em-dash.

*__Line-break__s**

Sometimes you would like to force text onto a new line but without starting a new paragraph. In LaTeX, use the command \linebreak.

*__Non-breaking Space__s**

It is often desirable to use a non-breaking space to force text including a space to stay together on the same line. A very common example is a number and its associated units; others include 'Figure', 'Table', or 'Section' with their associated number, and also first initials and surnames. For a non-breaking space in LaTeX, just type the character '~'.

*__Non-breaking Hyphe__ns**

Hyphens do not normally force the following text to stay on the same line. Sometimes it is better if it does, so a non-breaking hyphen is used. In LaTeX, the command is '\mbox{-}'.

*__Quotation Marks__**

Quotation marks in formatted text should be the proper 'curly' kind, which look like this: '…' or "…". Apostrophes should also be 'curly', e.g., 'don't'. In LaTeX, you use the convention `…' or ``…'' for single or double quotation marks, respectively; apostrophes are handled automatically. For usage of these characters, see Section 4.4.4. But note that the symbols for prime (', in LaTeX $'$ or $\prime$) and double prime ('', in LaTeX $''$), which are also used for minutes and seconds (and also feet and inches, if you need to use them), must not be 'curly'.

*__Thick and Thin Spac__es**

Spaces of more or less than standard width are especially useful for making mathematical expressions easier to read and understand. LaTeX provides thin (\,), medium (\:), and thick (\;) spaces in math mode.

7.1.5 Units

Units should always be in roman type, not italic.

This is a common error when LaTeX math mode is used. Two ways for doing it correctly are: $x=25~$mm, or $10^{34}~\rm{cm^{-2}s^{-1}}$.

RECOMMENDATION: Use SI units and their preferred (powers of 10^3) prefixes.

RECOMMENDATION: There should be a non-breaking space between the value and the symbol for the unit, to ensure that they stay together on the same line. (For how to do this, see Section 4. 1.2.)

7.1.6 Equations

Equations should only be inserted in-line if they are very short and simple. To preserve the line spacing, any fractions should be horizontal, using /, rather than vertical. All other equations should be on a separate line and centred. If there are several lines of equations, the method of aligning them depends to some extent on the context. Sometimes it is clearer if the equal signs are vertically aligned (e.g., in a derivation); if not, then the equations might be better left-aligned. Only number an equation if it is actually referred to in the text. The number should be in parentheses at the right-hand margin. The reference to it should be of the form 'Eq. (3)' unless the journal specifies otherwise; some prefer just '(3)' unless it is at the beginning of a sentence when they want a full word, e.g., 'Equation (3)'.

Punctuation of equations causes much argument. In-line equations should be punctuated just like any other part of a sentence, i.e., full stops (periods), semicolons, commas, etc. Journals usually ask for equations on their own to be punctuated as well. However, some people feel that having a full stop, semicolon, or comma at the end of an equation looks odd and do not do this.

RECOMMENDATION: Use punctuation for equations on their own.

In LaTeX, always use math mode for writing equations. Standard functions such as sine should use macros (e.g., \sin) so that they are correctly set in roman (not italic) text.

7.1.7 Use of Italics and Bold Type

- Italics and bold type can be used for emphasis, but this must be done sparingly. For example, 'I don't care *how* you do it; just *do* it.' The use of underlined text or capital letters for emphasis is generally discouraged and may also cause confusion with web links.
- Bold type is often used for the titles and headings in a document.
- Italics can be used instead of quotation marks for the titles of books, magazines, journals, articles, and papers. For example, 'The paper was published in *Physical Review Letters* recently.' If you are writing a paper for a journal, it is best to follow their own style rules concerning this.
- When new words are introduced, they are sometimes set off by using italics, bold type, or quotation marks. For example, 'This procedure is called a *pedestal run*.'
- Italics are used for variables and often for constants of nature and particle

symbols (see Section 7.1.2 and the note on superscripts and subscripts in Section 4. 2.1).

8 English Usage

8.1 General Considerations

8.1.1 Tense

It is difficult to use a fixed tense when writing a paper. The use of tense must be consistent within a sentence. The present tense should usually be used for statements whose validity remains as true when they are written as when they are read, e.g., 'The data agree with the theoretical predictions'. The past tense should be used for statements whose validity is dated, e.g., 'The data were recorded in 2008'.

In a paper, the introduction, where the current physics landscape is surveyed, will tend to be written in the present tense. Further along, the past tense will often be used to describe how the analysis was performed. The conclusion, which summarizes the new results, will probably be in the present.

8.1.2 Voices: Passive, Active, and Personal

Scientific literature has traditionally used the passive voice (e.g., 'A review of this problem was given by Bloggs') because it can sound more objective. On the other hand, the active voice (e.g., 'Bloggs reviewed this problem') is often more natural, shorter, and more direct—it can be used where there is a significant gain in clarity.

However, active writing often uses personal pronouns, e.g., 'we'. This is very often considered unscientific, immodest, and not sufficiently detached. It is a controversial point, as some publishers now encourage personal references in order to make the writing more engaging and human. Used sparingly, this can be useful in describing work by a small group.
RECOMMENDATION: Avoid the use of personal pronouns.

8.1.3 Sentence Structure

Avoid long, complicated sentences. If a sentence becomes really long, you will often find that it can be broken up into two or more sentences without losing any meaning. Long introductory elements in a sentence are not good style. Sentences are often more effective if the point you are trying to emphasize is given at the end of the sentence.

8.1.4 Jargon

Try to avoid using CEPC, IHEP or CERN-specific jargon, i.e., expressions used mainly within CEPC, IHEP or the collaboration at CERN, and be sure to define all of the terms you do use.

8.1.5 Acronyms

A ***glossa**ry** of CEPC acronyms and other terminology is provided separately in Ref. [4]. Although useful for brevity, do not use too many acronyms. Check whether you are really saving much space, and not just using them once or twice. Readers will have trouble remembering them all, especially since many are similar. Always define acronyms where they are first used, and re-define them at the start of main sections since not everyone will read the entire paper in sequential order.

When using initials as an abbreviation, do not use spaces or dots, e.g., UN, BBC, LHC. (American usage tends to put dots after each letter, e.g., 'U.S.A.'.) Some people recommend using all capital letters when the acronym is pronounced as letters (e.g., EU), and small letters when it is said like a word (e.g., Nasa). But some acronyms are pronounced both ways, so this seems artificial and likely to confuse.

RECOMMENDATION: Use all capital letters for acronyms (as we do with 'ATLAS' - A Toroidal LHC ApparatuS), such as ITK and OTK.

The pronunciation of acronyms also affects whether to use 'a' or 'an' in front of them. Use 'a' if it is pronounced as if it starts with a consonant sound (e.g., 'a ROD') and 'an' if it sounds as if it starts with a vowel sound (e.g., 'an AOD' or 'an SFI'); remember that some acronyms are pronounced as letters and others like a word.

4.2 Spelling

We will use American spelling, not British spelling.

4.3 Capitalization RULES and RECOMMENDATIONS

Capital letters are used to punctuate sentences, to distinguish proper nouns from other words, and in headings and titles. Capitalization is an area in which the rules are not completely rigid and tastes have evolved, with less use of capitalization now than in the past. We start with the agreed rules and then reach the less defined areas.

The first letter of a sentence is capitalized. A complete sentence starting after a colon begins with a capital letter in American usage, but not in British (recommended).

Proper names are capitalized, and this is useful to distinguish between a normal word and a name, e.g. 'the city of London' vs. 'the City' (the financial district of London). Capitalize the names of institutions, organizations, societies, and groups, e.g. 'the Pergamon Museum' or 'the Institute of Physics'. Note that 'the' is not capitalized.

Geographical locations and the names of buildings are capitalized, e.g. 'Times Square', 'the Pacific Ocean', 'the Empire State Building'.

Names derived from people, such as 'Breit–Wigner', 'Gaussian' or 'Cabibbo angle', are capitalized. But 'fermion', 'boson', and the names of most units are not.

(However, units named for people usually have a capitalized symbol. See Appendix A.) Titles of office or rank are capitalized, e.g. ‘President Obama’ or ‘Professor Higgins’.
The names of days of the week, months, festivals, and holidays are capitalized, e.g. ‘Tuesday, 5th November’, or ‘Easter’. So are historical periods, e.g. ‘the Renaissance’. But seasons are not, e.g. ‘summer’.
When written as words, do not capitalize the names of particles (e.g. neutrino), chemical elements (e.g. hydrogen), or chemical compounds (e.g. carbon dioxide).
People often over-use capitalization. Do not capitalize words for emphasis—use italics or bold type if necessary, but be sparing. Try to avoid writing specific terms, such as ‘global warming’, with capitals as if they were proper nouns.
Rules are less consistent for the titles of documents.Some journals capitalize all the main words in the title, but others use ‘regular’ capitalization—just the first word and proper nouns.
RECOMMENDATION: Only capitalize the first word and proper nouns of the title if you have the choice. (That way it will be clear which words are proper nouns.)
Capitalization of section and subsection headings again depends on the publisher. Sometimes the more important headings have all the main words capitalized and less important headings do not.
RECOMMENDATION: Only capitalize the first word and proper nouns of section and subsection headings unless the publisher requires otherwise.
The names of Monte Carlo simulation programs are often written in capital letters, but you should follow the choice of the author(s).

4.4 Hyphenation and dashes

4.4.1 Hyphenation

Hyphens are used in a number of ways. ‘Soft’ hyphens are used at the ends of lines to indicate that the last word is split and continues on the following line. This is mainly done when text is in narrow columns, to avoid having very wide, wasteful spaces. When the lines of text are the full width of the page there is little need for soft hyphens. Breaking up the words in a way that allows the reader to understand the text quickly and without ambiguity, while at the same time keeping the text layout efficient and attractive, is a specialist art for copy-editors and printers, and will not be discussed here.

‘Hard’ hyphens join words or parts of words (e.g. ‘second-rate’, ‘anti-nuclear’), and are sometimes essential to make the meaning clear. However, it is important to understand that in many cases there are no fixed rules. Much of the time there are other ways to write the same thing, or a hyphen is only used to make things easier to understand. Here we discuss the main situations that cause problems.

Compound words

There are no rigid rules for compound words. Like the example given earlier (‘end cap’, ‘end-cap’ or ‘endcap’), there are many cases where all three forms could be considered acceptable. In addition, the use of hyphens in compound words changes

with time, especially as exotic technical jargon or new concepts become well known and evolve into single words, e.g. ‘photo-multiplier’ becoming ‘photomultiplier’.

RECOMMENDATION: Try to minimize the number of hyphens by using them only where necessary (but note that the best solution will not always be clear).

This means considering both the ‘open’ form (e.g. the noun ‘set up’) and the ‘fused’ single-word form (‘setup’) as well as the hyphenated version (‘set-up’). (The verb is always ‘set up’.) There is a tendency (not universal) for **American English to use single words** and British English to use two words. Sometimes the hyphenated version is preferred to avoid awkward letter combinations, e.g. ‘take-off’, ‘part-time’. Below are some examples of open, hyphenated, and fused compound words.

Open: bubble chamber, charged current, drift chamber, Monte Carlo, neutral current, Standard Model.
Hyphenated: cross-section (this is controversial: hyphenation is preferred, but if unhyphenated is chosen do it consistently and hyphenate when used as a compound adjective), cross-check, cut-off, four-momentum, space-like, time-like, wave-function. (The last three are sometimes written as fused words.)
Fused: ultraviolet, electrodynamics, hypercharge, infrared, isospin, photomultiplier, photoproduction, pseudorapidity, renormalization, semiconductor, superconductor, subdivision, superposition.
Note the occasional use of ‘hanging’ hyphens when two or more similar words are used, e.g. ‘both second- and third-order differentials’. This is fine but do not do it too often.

Prefixes and suffixes
There are a number of prefixes and suffixes that are joined to words with hyphens, and in many cases the words pass into standard usage and lose the hyphen (but sometimes not everyone will agree).

Prefixes: anti-anything, but antiquark and antimatter; dilepton, diboson, dijets (not everyone agrees); multi-anything, non-anything, quasi-anything; n-type, p-type; re-entry, re-analyse, but renormalization.
Suffixes: anything-like, anything-less, but wireless.
Groups of modifiers
A very important use of hyphens is when a string of adjectives and nouns modifies a noun. In some cases, using a hyphen simply makes it easier to grasp the meaning quickly by grouping related words. Examples of this are: ‘up-to-date data’, ‘a wide-ranging review’, ‘a high-energy differential cross-section’ or ‘a next-to-leading-order calculation’.

But in many cases the hyphen is essential to make the meaning clear, and not

having the hyphen, or putting it somewhere else, actually changes the meaning. Consider the following examples:

'Disease-causing poor nutrition' vs. 'disease causing poor nutrition', i.e. does poor nutrition cause the disease, or does the disease cause poor nutrition?
'Two year-old computers' vs. 'two-year-old computers, i.e. are there two computers each one year old, or some computers that are two years old?
'Man eating lion seen' vs. 'man-eating lion seen', i.e. was there a man eating a lion, or a lion that likes to eat people?
'Cycling-friendly chief executive' vs. 'cycling friendly chief executive', i.e. is the chief executive sympathetic to cyclists, or is he a friendly person on a bicycle?
However, do not use more hyphens than are necessary to make the meaning clear. So 'Standard Model result' is clear without using any hyphens, and 'Standard Model cross-section' only has a hyphen because 'cross-section' is (preferably) hyphenated anyway.

One case where a string of modifiers does not take a hyphen is when the modifier is an adverb, most notably ending in -ly. That is because it is clear what the adverb is modifying. For example, 'badly written paper' or 'newly discovered particle'.

4.4.2 En-dashes

En-dashes (sometimes called 'en-rules') are a bit longer than a hyphen, nominally the width of the letter 'N'. See Section 4.3.4 for how to produce them. They have a number of uses:

As a minus sign (do not use a hyphen, it is not long enough).
To indicate a range of values, e.g. '27–31', or 'Monday–Wednesday'.
To join two words with some relationship, but not part of a string of adjectives, e.g. 'electron–positron annihilation', 'p–p scattering', 'permian–carboniferous boundary', or 'staff–student relations'.
To join the names of joint creators or authors, e.g. 'Fermi–Dirac statistics', since a hyphen might be taken to indicate the hyphenated name of one person.
To show the hierarchy when multiple hyphens would be confusing, e.g. 'high-priority–high-pressure tasks'.
En-dashes are normally used with no spaces between the words or characters and the en-dash (but see the last comment below on em-dashes).

4.4.3 Em-dashes

Em-dashes (sometimes called 'em-rules') are considerably longer than a hyphen, nominally the width of the letter 'M'. See Section 4.3.4 for how to produce them. They are used in two ways:

Like parentheses but indicating more emphasis, e.g. 'The repair took—we knew it would—far longer than planned'.

To introduce a phrase at the end of a sentence, instead of using a colon, mainly as an afterthought or an aside, e.g. ‘That publisher accepts material from most people—basically, anyone with money’.
Traditionally, em-dashes are put between words with no spaces. However, many publishers now put spaces around the dash but use an en-dash instead of an em-dash – like this. Whichever you choose, do it consistently.

4.5 Punctuation

4.5.1 Commas

Commas, like hyphens, are an area where usage is often a question of taste rather than rigid rules. In addition to clarifying the meaning of a sentence, they are also useful in breaking up long sentences to make them easier to understand quickly.

RECOMMENDATION: Try to minimize the use of commas to what is needed to ensure there is no ambiguity in the meaning, and to make sentences easier to understand.

Commas are used to set off ‘non-restrictive’, ‘non-defining’, or parenthetical clauses that add information not strictly essential to the sentence, e.g. ‘The valley’s people, who are Catholic, speak French.’ On the other hand, essential information (‘restrictive’ or ‘defining’ clauses) should not have commas, e.g. ‘The people who are on shift are really worried about this.’ (Try putting commas around ‘who are on shift’ to see how it changes the meaning.)

Do not use a comma to join two main clauses of a sentence linked by an adverb such as ‘therefore’ or ‘nevertheless’, so ‘He was tired, nevertheless he went on shift as usual.’ is incorrect. Instead use either a semicolon (‘He was tired; nevertheless he went on shift as usual.’), or use a conjunction such as ‘and’, ‘but’, or ‘so’ (‘He was tired, but he went on shift as usual.’).

Adverbs such as ‘however’, ‘therefore’ and ‘already’ should usually be followed by a comma when at the beginning of a sentence, and enclosed in commas when in the middle, e.g. ‘However, the other method of analysis …’ and ‘There was, however, one important difference’. An exception to this is when qualifying an adjective or adverb, for example ‘However much work you do …’.

A controversial point is the use of commas before ‘and’ and ‘or’ at the end of a list of items. This is called an ‘Oxford’ and even a ‘Harvard’ comma, though many other publishers also use it. Examples are ‘mad, bad, and dangerous to know’ and ‘Birmingham, Heidelberg, Mainz, or Stockholm universities’. Omitting the final comma in these examples is also correct, and would not change the meaning. However, there are cases where the comma is definitely needed to make the meaning clear. Compare ‘She took photographs of her parents, the president, and the vice president’ with ‘She took photographs of her parents, the president and

the vice president'. It is not clear whether the second sentence is saying that the president and vice president are her parents or not.

4.5.2 Semicolons and colons

The semicolon is a separator that is stronger than a comma but does not end a sentence.

Use a semicolon to divide clauses that could stand as sentences in their own right, but are better left in the same sentence because one explains or complements the other, e.g. 'Some of the students were brilliant; others were less so.' or 'The cooling pipes go through the gap in the detector; the signal cables follow the same route.'
In a sentence already subdivided by commas, a semicolon indicates a stronger division, e.g. 'They pointed out that they had used the equipment required; had taken every reasonable precaution, including some not mentioned in the manual; and that the program had been written by qualified programmers, all very experienced.'
In a list where some elements already contain commas, use semicolons to clarify the relationships, e.g. 'This work was supported by BMBF, Germany; The Swedish Research Council, Sweden; and the Science and Technology Facilities Council, United Kingdom.'
The colon points forward, with the same function as words like 'namely', 'that is', 'as', 'for example', 'because' or 'therefore'.

The material following a colon does not have to be able to stand alone as a sentence, e.g. 'It is available in two colours: white or black.'
The colon can be used to introduce a list, e.g. 'We need the following: a computer, some diagnostic software, an oscilloscope, and a logic analyser.'
Do not use a colon followed by other linking words to introduce a list or statement, e.g. 'She outlined the lives of three physicists, namely, Planck, Heisenberg, and Dirac.' However, you can use a colon if it is after the link word, e.g. 'She gave an example: the Dirac equation.'
Both a colon and an em-dash can be used to introduce a phrase at the end of a sentence, but the em-dash is less formal and often implies an afterthought or an aside.
Do not put a space before a colon.

4.4.3 Apostrophes

The apostrophe has two main uses. The first, usually together with an 's', indicates possession, e.g. Maxwell's distribution. The second use indicates that letters have been omitted in a word, e.g. don't for do not, or I've for I have. A guideline for formal writing is to try to minimize the use of such contractions. (In this section, examples are in italics rather than quotation marks to make the use of apostrophes more obvious.)

The possessive for words ending in 's' can be confusing. Add an 's' after the

apostrophe if the result is easy to pronounce, but not if it is awkward (e.g. Jones's data but Archimedes' Principle). This is an area where people disagree, so use your judgement.

The possessive for plurals ending in 's' can be confusing. A general recommendation is to use the apostrophe but omit the extra 's'. As an indication of the subtleties, compare the singular and plural usage in the following four phrases: my sister's friend's studies; my sisters' friends' studies; my sisters' friend's studies; my sister's friends' studies.

A special case concerns periods of time, e.g. two days' time, six weeks' holiday.

People understandably get very confused about its and it's. Its without an apostrophe is the possessive. It's with an apostrophe is short for it is; this looks like a possessive but is not. However, it has unfortunately become increasingly common for popular publications to be sloppy about this, and it's is being used more and more often as a possessive.

Do not use apostrophes to indicate plural acronyms, e.g. RODs not ROD's. (Not everyone agrees with this—apostrophes used to be normal usage.)

Apostrophes can be used to indicate plurals of single letters and Greek letters, especially when not using an apostrophe would be unclear or ambiguous.

Never use the incorrect 'greengrocer's apostrophe' for plurals. This gets its name from shops which incorrectly label items with words like lettuce's, or video's. The apostrophe is not needed for plural words. It should only be used when there is a need for clarity, e.g. dot the i's and cross the t's, or subtract all the x's from all the y's.

4.4.4 Quotation marks

Single ('…') and double ("…") quotation marks, often called 'inverted commas' in British English, are another area where American usage is well defined but British usage presents a choice. See Section 4.3.4 for how to type proper 'curly' quotation marks. (In this section, examples are in italics rather than quotation marks to make the use of quotation marks more obvious.)

Traditional British practice is to enclose quoted matter in single quotation marks, and to use double quotation marks for a quotation within a quotation. This is completely reversed in American writing, and now also in much British writing (notably newspapers and magazines). For example, 'Have you any idea', she said, 'what "red mercury" is?' would be traditional British, while "Have you any idea", she said, "what 'red mercury' is?" would be American, or nowadays much British, usage. Unless the journal requires the older British usage, double quotation marks are recommended.

Quotation marks are also used for the first occurrence of an unfamiliar or newly-invented word or phrase, or one used in a technical sense, e.g. the birth, or 'calving' of an iceberg, or This scheme is called 'bunch-crossing multiplexing'.

Finally, quotation marks can be used to distance the writer from a point of view, a claim, or an expression, e.g. the organization of 'voluntary' night shifts.

4.6 Miscellaneous items

4.6.1 Plurals

Here we are concerned with two different aspects of plurals: whether some things are singular or plural, and how to form the plurals of some words.

RECOMMENDATION: Data should usually be considered as plural (with the rarely used singular 'datum'), e.g. 'the data were analysed'.

Sometimes people refer to data as singular, e.g. 'the data was analysed'. This is not strictly wrong, and if you do it be sure to be consistent, but it is not the favoured usage.

RECOMMENDATION: A collaboration, organization or company should usually be treated as singular, e.g. 'CEPC has decided to …', not plural, e.g. 'CEPC have decided to …'. Again, not everyone agrees but the singular is far more widely used.

Although many English words simply add an 's' for the plural, there are numerous others that do other things. Some add -es, e.g. 'wishes', 'patches', or 'tomatoes'. And some plurals do not have an 's' at all, e.g. 'children' or 'sheep'.

The possessive form of plural nouns, and how apostrophes are used, is discussed in Section 4.4.3. The generally accepted way to form plural acronyms is to add an 's', but without any apostrophe, e.g. 'RODs'. Never use the 'greengrocer's apostrophe' (again see Section 4.4.3).

Plurals of non-English words are in a state of change. Do you say 'formulas' or 'formulae', 'stadiums' or 'stadia', 'bureaus' or 'bureaux', 'referendums' or 'referenda'?

RECOMMENDATION: Use English forms of the plural (the first in each example) instead of the non-English one when they exist. Note, however, that 'alumni' and 'nuclei' remain standard usage.

To make matters more confusing there is 'index'. Referring to many books we might talk of 'indexes', but for a mathematical expression use 'indices' for the plural. A similar word is 'vertex', for which the plural is 'vertices'.

A very common mistake, made nowadays by many native English speakers, is to use the plural 'criteria' instead of the singular 'criterion' if there is only one. Similarly, the singular of 'media' is 'medium', and the singular of 'phenomena' is 'phenomenon'. It is wrong to say 'a criteria', 'this storage media' or 'that phenomena'.

4.6.2 Which vs. that

This is a common confusion. For a 'restrictive' clause, i.e. one that defines something or restricts the scope, 'that' can be used. In British English, but not American, 'which' can also be used. So for example, 'all tracks that were not identified as coming from conversions were combined with tracks of positive charge' since you are restricting the tracks to those not coming from conversions. On the other hand, for a 'non-restrictive' clause that simply adds information, 'which' can be used but never 'that'. For example, 'cell clusters were also formed, which were then used to aid in electron identification' gives additional information without defining a subset.

4.6.3 Split infinitives

A split infinitive occurs when you put an adverb in the middle of an infinitive, rather than before or after it. One of the best known examples comes from Star Trek: 'To boldly go where no man has gone before.' Many people believe that split infinitives are wrong or are bad style, but they are not. They tend to be used more in American than British English.

My personal approach is to try to avoid using them if it is easy and the result sounds good, simply in order to avoid unnecessary arguments. But in some cases avoiding a split infinitive sounds awkward, or less strong. How would you re-write 'we expect our recorded data to more than double by next year'? In such cases use the split infinitive.

4.6.4 Homophones

These are many pairs of words that sound the same but are spelled differently, and have different meanings. Even native English speakers get these wrong very often. Here are some common ones:

affect vs. effect: to produce an effect on something or someone vs. the result of an action. For example, 'Exhortations in the style guide had no effect (noun) on the number of mistakes; the level of mistakes was not affected (verb) by exhortations in the style guide; we hope to effect (verb) a change in this.' (Guardian Style Guide)

complement vs. compliment: to make complete vs. praise.

discreet vs. discrete: tactful or circumspect vs. separate.

principal vs. principle: first in rank or importance vs. fundamental truth, rule or standard of conduct.

stationary vs. stationery: not moving or changing vs. writing materials.

4.6.5 A vs. an

The two forms of indefinite article, 'a' and 'an', are meant to make things sound good.

The basic rule is to use 'a' before words starting with a consonant and 'an' before vowels. A big exception is for words beginning with 'h', which is often silent. So we write 'a hadron' but 'an hour'. However, a few words are sometimes pronounced with a silent 'h' but sometimes not, e.g. 'herb' (silent 'h' in American but not in British)—in these cases 'a' or 'an' becomes a matter of taste. (In the past we were taught to write things like 'an hotel', but that is no longer fashionable; it now depends on pronunciation.)

There are some words beginning with a vowel that is pronounced like a consonant, so use 'a' (e.g. 'a unit'). And there are cases where a consonant sounds as if it begins with a vowel, such as 'an x-dependence'.

4.6.6 Some common abbreviations

There are a number of 'standard' abbreviations that you can assume readers will understand. However, do not overdo it, especially since many readers will not be native English speakers, and if you have any doubts then spell them out.

You can assume familiarity with widely known abbreviations such as 'UN', 'US', 'UK', and CERN, as well as 'AD' and 'BC' to specify the era. Other abbreviations should be defined on their first appearance.
Some Latin-based abbreviations are often used to make English a bit more compact. There is no need to write these in italics. They include:

etc. (et cetera) = and other things
et al. (et alii) = and others (some publishers do put this in italics)
i.e. (id est) = that is
e.g. (exempli gratia) = for example
N.B. (nota bene) = note well
cf. (confer) = compare
Rarer forms that now tend to be discouraged are 'viz' (videlicet) meaning 'namely', and 'ibid.' (ibidem) meaning 'in the same place' and used for references.
If a sentence ends on an abbreviation (e.g. 'etc.') use only one full stop (period), not two.

4.6.7 Miscellaneous items and physics-related items

Beware of being over-precise in writing numbers with errors. It is usually nonsense to quote three significant figures on errors, and even two is often too many. Very few results are known to 1% precision, let alone better.
When writing symbols in LATEX, use the latest version of the official style file cepcphysics.sty [3] rather than trying to define the symbol yourself.
If the symbol is to be followed by a space, use a trailing '\ ' (e.g. '\pt\ ') to ensure this. Note that there is a space after the '\'. The '\ ' is not needed if there is something other than a space, such as a punctuation, after the symbol.
Use Greek letters for particle symbols—do not spell out Greek letter names, e.g. π or μ not 'pi' or 'mu'. However, 'pion' or 'muon' are acceptable.
The complications of notating different τ decay modes are spelled out in a separate note [12].
Note the difference between particles (the underlying physical objects) and the measured quantities such as tracks or clusters.
'Higgs boson', not just 'the Higgs'. If you have to use phrases like 'Higgs boson mass' a lot you might use the full form the first time, but then just 'Higgs mass'.
The Z boson should be written without the zero (i.e. Z rather than Z0).
'B-physics' (not 'b-physics'), but 'b-tagging', 'b-quarks', 'b-jets'.
Always use a cursive ℓ (\ell in LATEX) for a generic lepton (usually e or μ).
Use m rather than M for masses, e.g. mW, mH, mt.
Write 'Standard Model' capitalized. Do not abbreviate it in the abstract. If it occurs often, write it out the first time you use it and define the abbreviation: 'Standard Model (SM)'. Likewise, 'MSSM' is acceptable but define it on first use.
In physics 'Monte Carlo' is an adjective, so it should always be followed by a noun (e.g. 'Monte Carlo simulation'). Using 'Monte Carlo' on its own as a noun (e.g. 'corrections obtained from Monte Carlo') could imply the city of that name.

‘Confidence level’ can be abbreviated to ‘CL’ (but define it on first use); note that it is ‘level’ not ‘limit’. Writing it as ‘C.L.’ is discouraged.
Use ΔR rather than R for \sqrt {(Δ \eta)^2 + (Δ \phi)^2}.
Higgs production processes should be written as ‘gluon fusion’ not ‘gluon–gluon fusion’, and ‘vector-boson fusion (VBF)’ not ‘weak-boson fusion’.
Avoid CEPC-specific jargon as ‘truth particle’ (and ‘truth’ in general), etc.

4.6.8 Common mistakes by non-native English speakers

Languages have many subtle points, so it is not surprising that even people who have learned a language well and speak it very fluently will still make small mistakes in writing it. The actual mistakes of course depend on the person’s native language, but there are some constructions that come up commonly at CERN that are perhaps worth pointing out.

‘Since five years’ should be something like ‘for five years’ or ‘five years ago’, depending on the exact situation.
‘Allows to measure’ should be something like ‘allows measurement of’.
‘I will shortly describe’ should often be ‘I will briefly describe’, since ‘shortly’ means ‘after a short time’ not ‘for a short time’.
‘Until Friday’ or ‘till Friday’ should often be replaced with ‘by Friday’.
‘We did a control of’ should be ‘we did a test of’ or ‘we did an examination of’, since ‘control’ does not have that meaning in English.
‘Built’ is often used incorrectly instead of ‘build’. ‘Built’ is the past of the verb ‘to build’, and the present tense is ‘build’. The computer jargon term is ‘nightly build’. Similarly for ‘sent’ and ‘send’.
‘How xx looks like’ should either be ‘how xx looks’ or ‘what xx looks like’.
‘For what concerns xx’ should be ‘concerning xx’, ‘as regards xx’, or ‘as far as xx is concerned’.
‘As it is the case’ should be ‘as is the case’—do not use ‘it’ in this way.
‘This shows how bad the tracks were aligned’—should say ‘badly’; similarly for ‘seriously’, ’precisely’, etc.
There is a useful CERN page [7] on avoiding ‘franglais’, useful not only for native French speakers but also for many others (including some native English speakers!) who have been at CERN for a long time.

4.6.9 Other points of English

Use ‘alternatively’ rather than ‘alternately’, unless you mean something that alternates.
Do not use ‘essentially’ (fundamentally or basically) to mean ‘effectively’ or ‘approximately’.
Do not confuse ‘imply’ (strongly suggests) with ‘infer’ (deduce from facts and reasoning).
To make certain of or to guarantee something, British usage is ‘ensure’ and American is either ‘insure’ or ‘ensure’. (But if it concerns insurance it is always ‘insure’.)

If something has been lost you ‘lose’ it, you do not ‘loose’ it. ‘Loose’ means ‘not tight’. (This mistake is very common in British writing.)
The past of ‘to lead’ is ‘led’, not ‘lead’ (unlike ‘read’, the past of ‘to read’).
Use ‘allows’, not ‘allows for’, if you mean something is permitted or enabled. For example, ‘doing this allows changes due to ageing to be estimated’. ‘Allows for’ means you have considered something that is possible but not certain, for example ‘the error quoted allows for possible changes due to ageing’.
‘Presently’ means ‘soon’, and in US usage can also mean ‘now’. ‘Momentarily’ means ‘for a moment’, and in US usage can also mean ‘at any moment’. If you want to be certain that your meaning is clear, it might be best to avoid using either of these.
There is a useful list containing more terms which are commonly misused on the CERN web pages on style [7].