Hello world! What chance is there of this working?

1 Quick start example

You have to begin somewhere. This trivial example shows you how to write some mathematics, which is one of the most obvious differences compared to using e.g. MS Word and Equation Editor. Maths can be written "inline" or displayed separately from the paragraph text, either as a numbered or an unnumbered equation. For example, typing `$\Lambda_b\to\Lambda^0\mu^+\mu^-$` will produce $\Lambda_b \to \Lambda^0\mu^+\mu^-$ (the $ symbol tells LaTeX to start formatting what follows as mathematics, the trailing $ to stop this formatting.

If you want to write your maths as a separate numbered equation, you use a simple syntax like

```
\begin{equation}
A=b+c
\label{trivial}
\end{equation}
```

which is displayed as

$$A = b + c \tag{1}$$

Note that LaTeX does not care about whitespace between words in a paragraph, it sorts out the interword spacing for you. To start a new paragraph, simply leave a blank line in your input file.

1.1 Equations

With a little more substance, and interest, we introduce

```
\begin{equation}
\sigma(e^+ e^- \rightarrow f\overline{f})
  = \frac{12\pi}{m^2_Z}
  \frac{s\Gamma_\mathrm{e}\Gamma_f}{(s-m^2_Z)^2+\Gamma^2_Zm^2_Z}
\label{rbw}
\end{equation}
```

which when formatted by LaTeX, appears as

$$\sigma(e^+e^- \rightarrow f\overline{f}) = \frac{12\pi}{m_Z^2}\frac{s\Gamma_\mathrm{e}\Gamma_f}{(s-m_Z^2)^2+\Gamma_Z^2m_Z^2}, \tag{2}$$

You can refer to objects such as equations, tables, subsections, etc. by using the `\ref` command, e.g.

```
See equation~\ref{trivial} and equation~\ref{rbw}
```

is typeset as "See equation 1 and equation 2".

1.2 References

Similarly, you can refer to subsections (or any other object) in the same way, by adding a `\label{mytext}` directly after the element you are interested in, and then referring to it using `\ref{mytext}`. The numbering for each set of elements such as tables, figures, equations is independent.

For example, we can refer to Section 1.1, Section 1, Equations 1 and 2, and the equation found on page 1 using the following:

```
Section~\ref{mystart}, Equations~\ref{trivial} and \ref{rbw}, and the
equation found on page~\pageref{rbw}
```

There are many aspects of using LaTeX that will save you time, see online tutorials for examples. You can make lists using several different constuctions, e.g.

```
\begin{itemize}
 \item first
 \item second
\end{itemize}
or
\begin{enumerate}
 \item firstly
 \item secondly
\end{enumerate}
and lists can of course be nested,
\begin{enumerate}
 \item first
 \item second
 \begin{enumerate}
  \item firstly
  \item secondly
 \end{enumerate}
\end{enumerate}
```

The above is formatted as

- first

- second

or

1. firstly
2. secondly

and lists can of course be nested,

1. first
2. second
   (a) firstly
   (b) secondly

Note that in this example, we have not worried about how the nested levels of list are formatted, we have only told LaTeX that the lists are inside one another. Whether the different levels are formatted as 2(a) or 2(1) or 2(i), etc. is only a detail of appearance. This can of course be changed within your document, but such changes are normally made for the whole document, to maintain uniform appearance, as you would when writing a textbook or scientific paper.

1.3 Including images

Images can be included in most graphics formats (.pdf, .png, .jpg, .eps, ...), but not all types can be mixed within the same document (notably .eps and others).

The usual way to include a figure is within a `\begin{figure}...` environment.

```
% The "optional" arguments appear in square brackets define position of
% the figure within the document: "here"; "top", "bottom" (of page),
% or (separate) "page".
\begin{figure}[htbp]
  \centering
  \includegraphics[width=0.8\textwidth]{LHCbDetectorpnglight1.png}
\caption{Here is one we made earlier}
\label{mydetector}
\end{figure}
```

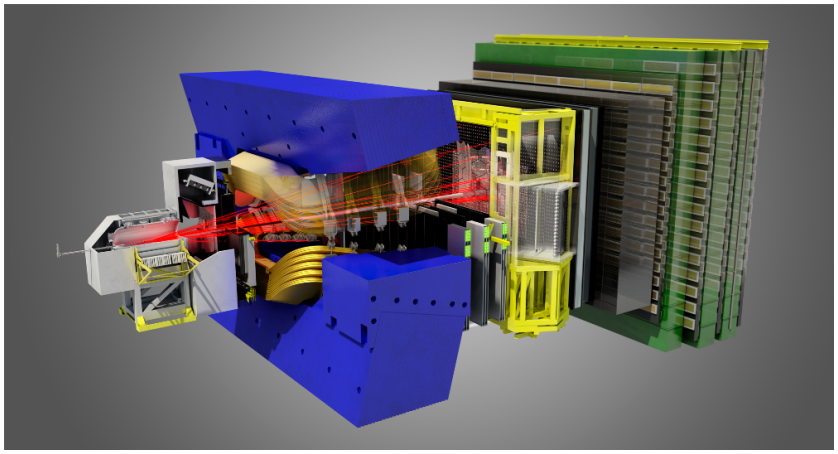

Figure 1: Here is one we made earlier

We refer to the figure as `Figure~\ref{mydetector}` which formats as Figure 1. (Note that the ~ character which we keep using is invisible "glue" character, by default it is not formatted, but ensures two characters are not separated from each other, hence often used to tie an object such as Figure, Table, Section to its related number.

1.4 Footnotes and citations

LaTeX makes it easy to use footnotes[1], but you can insert them trivially and not worry about where they will appear in the text. This footnote is created using

```
...to use footnotes\footnote{Excessive use is distracting.}, but you ...
```

Similarly, using a bibliography is straightforward. In its simplest form, and this is the best way to get started, you can define your own format for references in the same source document as you are preparing your main text. This is very efficient for up to medium-sized documents. When you repeatedly write about similar subjects, you may prefer to create a LaTeX database (usually with the `bibtex` package) which, although it can be slower to set up initially, will save time overall. It can be particularly useful for larger collaborative projects (think: Group Studies). Furthermore, there are many online databases of publications that can create the required LaTeX (or bibtex) output for you directly. You can refer to your favourite set of papers used in your document, which may include a more-or-less well-known paper [1] from 1964, which was followed by a related pair of articles [2, 3].

[1] Excessive use is distracting.

Each of these citations is generated using the commands, e.g.

```
well-known paper~\cite{Higgs:1964pj}...
pair of articles~\cite{Higgs:1964ia,Higgs:1966ev}}.
```

where the argument of the `\cite` command must match the corresponding `\bibitem{...}` element in the bibliography part of your source(s) file(s).

The format of the bibliograhy consists of a `\begin{thebibliography}`, a `\end{thebibliography}`, and a series of `\bibitem{mytext}` entries, one per reference to be cited. The format of each of these `\bibitem{mytext}` entries is free for you to choose, but you may wish to follow a style, e.g. as used in a particular scientific journal related to your particular field of interest.

The bibliography used in this example is generated using the following LaTeX source commands:

```
\begin{thebibliography}{99} % The 99 here just means that the list of
                            % references can be up to 2 characters in
                            % length, so 99 maximum references.
%\cite{Higgs:1964pj}
\bibitem{Higgs:1964pj}
  P.~W.~Higgs,
  %``Broken Symmetries and the Masses of Gauge Bosons,''
  Phys.\ Rev.\ Lett.\  {\bf 13} (1964) 508.
  %%CITATION = PRLTA,13,508;%%
  %2857 citations counted in INSPIRE as of 06 Oct 2014

%\cite{Higgs:1964ia}
\bibitem{Higgs:1964ia}
  P.~W.~Higgs,
  %``Broken symmetries, massless particles and gauge fields,''
  Phys.\ Lett.\  {\bf 12} (1964) 132.
  %%CITATION = PHLTA,12,132;%%
  %2852 citations counted in INSPIRE as of 06 Oct 2014

%\cite{Higgs:1966ev}
\bibitem{Higgs:1966ev}
  P.~W.~Higgs,
  %``Spontaneous Symmetry Breakdown without Massless Bosons,''
  Phys.\ Rev.\  {\bf 145} (1966) 1156.
  %%CITATION = PHRVA,145,1156;%%
  %2076 citations counted in INSPIRE as of 06 Oct 2014
\end{thebibliography}
```

References

[1] P. W. Higgs, Phys. Rev. Lett. **13** (1964) 508.

[2] P. W. Higgs, Phys. Lett. **12** (1964) 132.

[3] P. W. Higgs, Phys. Rev. **145** (1966) 1156.