Hello LaTeX

An Introduction to the
Typesetting Tool

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Contents

1 Motivation

- High quality documents
- Automation - don't do the computer's job!
- Widely available and extraordinarily flexible
- Open-Source (and free)
- Enormous and extremely helpful user base
  - CTAN - Comprehensive TeX Archive Network
  - TeX Stack Exchange
  - Overleaf guides
- Nearly unlimited skillcap - actual benefits to improving

2 Packages

There are a few base packages that you should (almost) always import:

1. import
2. geometry
3. hyperref
4. amsmath
5. amsfonts
6. amssymb
7. inputenc
8. fontenc
9. biblatex
10. float
11. graphicx

...And a few that you'll typically include (and are used to prepare this document).

1. booktabs - Pretty professional tables
2. csvsimple - Simplify table generation
3. siunitx - Nice, clean, units
4. minted - Beautiful blocks of highlighted code thanks to Pygments
5. chemformula - Convenient chemical equation display

```
\usepackage{import}
\usepackage{geometry}
\usepackage{hyperref}
\usepackage[tbtags]{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage[utf8]{inputenc}
\usepackage[T1]{fontenc}
\usepackage[style=ieee,backend=biber]{biblatex}
\usepackage{float}
\usepackage{graphicx}
\usepackage{booktabs}
\usepackage{csvsimple}
\usepackage{siunitx}
\usepackage{minted}
\usepackage{chemformula}
```

Listing 1: Code to include packages in a LaTeXdocument (as used in this document)

3 Sections...

3.1 ...and subsections...

3.1.1 ...and subsubsections...

4 Equations

How about some equations?

$$\begin{aligned}\delta &= -\frac{B^2}{180,000} + \frac{B}{173} + 0.5 \\ &= -\frac{533^2}{180,000} + \frac{533}{173} + 0.5 \\ &= 2.0\end{aligned}$$

Or even a matrix

$$A = \begin{bmatrix} -\alpha_f - \beta_1 & 2 & \frac{1}{c} \\ -4i & \sqrt{5-\alpha_f} & -6 \\ c & \beta_1 & 9+i \end{bmatrix}$$

Calculus!

$$\frac{\mathrm{d}x}{\mathrm{d}t} = \sigma(y - x) \tag{1}$$

$$\frac{\mathrm{d}y}{\mathrm{d}t} = x(\rho - z) - y \tag{2}$$

$$\frac{\mathrm{d}z}{\mathrm{d}t} = xy - \beta z \tag{3}$$

An example with an integral, the Fourier Transform

$$\hat{f}\left(\xi\right) = \int_{-\infty}^{\infty} f\left(\xi\right) e^{2\pi i x \xi} \mathrm{d}\xi \tag{4}$$

5 Figures

You can add lovely figures, and then reference them like this "As stated in Figure 1". It's even a hyperlink! **click* *click**

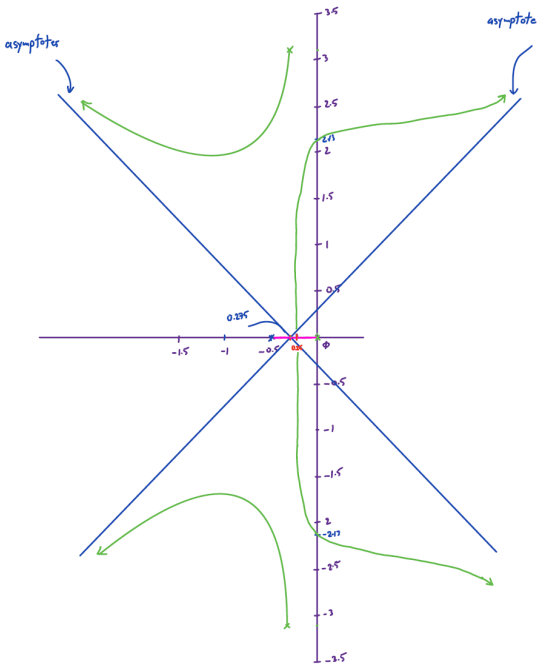

Figure 1: A test figure

6 Tables

What are tables like? Like this!

Table 1: Table of specified parameters and achieved values

Parameter	**Target**	**Calculated**	**Simulated**
NF_{dsb}	≤ 4	11.17	5.95
$IIP3$	≥ -22	≥ -2.73	-4.98
1 dB Compression	≥ -32	≥ -12.73	-14.2
Gain	≥ 16	≥ -3.26	-4.58
I_{bias}			
I_{buf}			
I_{ref}		1	1
R_D	≤ 10	570	600
V_{lo}	≤ 1		
V_{rf}	≤ 1		

7 Additional Helpful Packages

- siunitx I strongly recommend using the siunitx package for formatting all units.
  Hz
  100 nm to 200 nm
  100 kg
  Convenient!

- minted

```python
def string2bits(s=''):
    return [bin(ord(x))[2:].zfill(8) for x in s]

def bits2string(b=None):
    return ''.join([chr(int(x, 2)) for x in b])

s = 'Hello, World!'
b = string2bits(s)
s2 = bits2string(b)

print 'String:'
print s

print '\nList of Bits:'
for x in b:
    print x

print '\nString:'
print s2
```

Listing 2: An example of a block of python included and highlighted with the package minted

- chemformula A chemical (or nuclear) equation!

$$^{2}\mathrm{H} + {}^{2}\mathrm{H} \longrightarrow {}^{3}\mathrm{He} + \mathrm{n}^{0} \tag{5}$$

8 Bibliography

8.1 Writing the .bib File

```
@incollection{ref:01,
author = {Berger, M.J. and Hubbell, J.H. and Seltzer, S.M. and Chang, J. and
↪  Coursey, J.S. and Sukumar, R. and Zucker, D.S. and Olsen, K.},
title = {XCOM: Photon Cross Sections Database},
publisher = {NIST, PLM, Radiation Physics Division},
year = {2010},
booktitle = {NIST Standard Reference Database 8 (XGAM)},
chapter = {Copper},
url = {https://physics.nist.gov/cgi-bin/Xcom/xcom3_1},
}
```

Listing 3: Code for a bibliographic entry

While you may have to write a bib entry manually occasional, almost all journal websites offer .bib citations to copy and paste (or download). There are also a number of tools that simplify .bib generation:

- Lookup books by their ISBN and get a bibtex entry lead.to
- Browser extension to create bibtex entries from the current webpage (available for firefox and chrome)bibitnow
- many others

8.2 Using the References

Here I am making a statement that should be backed up with a reference placed right at the end. [1] Now it will show up in the bibliography and the reference above will link to it and be correctly numbered. For Free!

References

[1] M. Berger, J. Hubbell, S. Seltzer, *et al.*, "Xcom: Photon cross sections database," in *NIST Standard Reference Database 8 (XGAM)*, NIST, PLM, Radiation Physics Division, 2010, ch. Copper. [Online]. Available: `https://physics.nist.gov/cgi-bin/Xcom/xcom3_1`.