

Hello L^AT_EX

An Introduction to the
Typesetting Tool

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1 Motivation

- WYSIWIG (What you see is what you get) vs. WYSIWYW (what you see is what you want)
 - *Theoretically* Word *could* do it but it'll fight you for it!
 - Reduce, Reuse, Recycle - Once you've done it, you can use it again, reuse your code!
- Consistent 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 - debugging less of an exercise in pulling teeth
 - CTAN - Comprehensive TeX Archive Network
 - TeX Stack Exchange
 - Overleaf guides

2 The Basics

- environments

```
\begin{<environment>}
  <your code>
\end{<environment>}
```
- commands

```
\command[<some options>]{<arguments>}
```

3 Sections...

3.1 ...and subsections...

3.1.1 ...and subsubsections...

4 Equations

How about some equations? An inline equation, showing the Pythagorean theorem $a^2 = b^2 + c^2$. Or a bigger example, one that I'd like to reference and discuss more, the Fourier Transform as given in Equation 1.

$$\hat{f}(\xi) = \int_{-\infty}^{\infty} f(\xi) e^{2\pi i x \xi} d\xi \quad (1)$$

What if instead I wanted to show substitution and developing equations? (notice the size of the brackets...)

$$\begin{aligned} \delta &= B \left(\frac{1}{173} - \frac{B}{180,000} \right) + 0.5 \\ &= 533 \left(\frac{1}{173} - \frac{533}{180,000} \right) + 0.5 \\ &= 2.0 \end{aligned}$$

Or even a matrix

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

A set of differential equations!

$$\frac{dx}{dt} = \sigma(y - x) \quad (2)$$

$$\frac{dy}{dt} = x(\rho - z) - y \quad (3)$$

$$\frac{dz}{dt} = xy - \beta z \quad (4)$$

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**

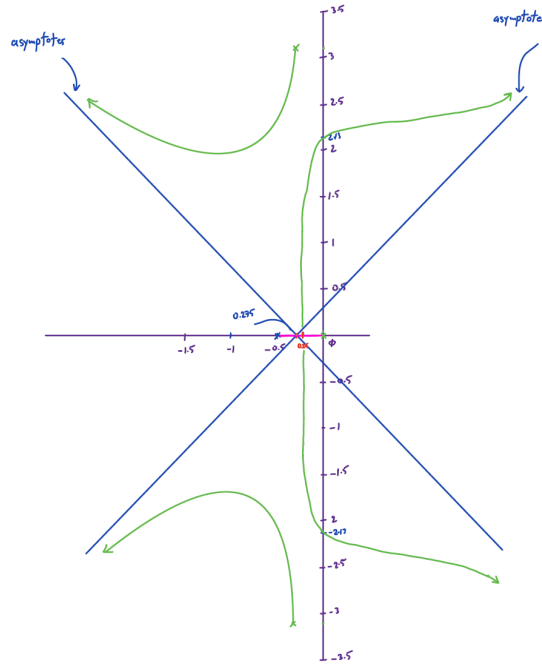


Figure 1: A test figure

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		

Can also make use of online table generation tools like Tables Generator.

7 Additional Helpful Packages

7.1 siunitx

I strongly recommend using the siunitx package for formatting all units.

Hz

100 nm to 200 nm

100 kg

Convenient!

7.2 chemformula

A chemical (or nuclear) equation!



7.3 minted

Include blocks of code or source files with syntax highlighting.

```

1  def string2bits(s=''):
2      return [bin(ord(x))[2:].zfill(8) for x in s]
3
4  def bits2string(b=None):
5      return ''.join([chr(int(x, 2)) for x in b])
6
7  s = 'Hello, World!'
8  b = string2bits(s)
9  s2 = bits2string(b)
10
11 print 'String: '
12 print s
13
14 print '\nList of Bits: '
15 for x in b:
16     print x
17
18 print '\nString: '
19 print s2

```

Listing 1: An example of a block of python included and highlighted with the package minted

8 Bibliographies

8.1 Citations

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. Style can be changed at any time up above in the biblatex command.

8.2 Writing the .bib File

```
1 @incollection{ref:01,  
2   author = {Berger, M.J. and Hubbell, J.H. and Seltzer, S.M. and Chang, J. and  
3     ↪ Coursey, J.S. and Sukumar, R. and Zucker, D.S. and Olsen, K.},  
4   title = {XCOM Photon Cross Sections Database},  
5   publisher = {NIST, PLM Radiation Physics Division},  
6   year = {2010},  
7   booktitle = {NIST Standard Reference Database 8 (XGAM)},  
8   chapter = {Copper},  
9   url = {https://physics.nist.gov/cgi-bin/Xcom/xcom8_1},  
}
```

Listing 2: 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

9 Starting Your Document

To start your document, you need to first declare your document class, then list any packages you'd like to include. Here are a few base packages that you should (almost) always import:

1. geometry
2. hyperref
3. amsmath
4. amsfons
5. amssymb

6. inputenc
7. fontenc
8. biblatex
9. float
10. graphicx
11. booktabs
12. csvsimple
13. siunitx
14. minted
15. chemformula

Next, start the document environments, and you're off! All together, your base document will look like the code in Listing 3 shown below.

```

1  \documentclass[hidelinks, 12pt]{article}
2
3  \usepackage{import}
4  \usepackage{geometry}
5  \usepackage{hyperref}
6  \usepackage[tbtags]{ansnath}
7  \usepackage{ansfonts}
8  \usepackage{anssynb}
9  \usepackage[utf8]{inputenc}
10 \usepackage[T1]{fontenc}
11 \usepackage[style=ieee, backend=biber]{biblatex}
12 \usepackage{float}
13 \usepackage{graphicx}
14 \usepackage{booktabs}
15 \usepackage{csvsimple}
16 \usepackage{siunitx}
17 \usepackage{minted}
18 \usepackage{chenaformula}
19
20 \begin{document}
21     <your document code>
22 \end{document}

```

Listing 3: Base code for a L^AT_EX document

10 What's Next?

- simplify code reuse? import!
- custom graphics and more? PGF/TikZ!
- fancy glossaries and acronyms? glossaries!
- presentations? beamer!
- and still more at the coming workshops!

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.