

Hello L^AT_EX

An Introduction to the
Typesetting Tool

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January 25, 2023

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List of Figures

1 A test figure 5

1 Sections...

1.1 ...and subsections...

1.1.1 ...and subsubsections...

2 Lists

2.1 Ordered

1. shutdown the computer
2. unplug the computer
3. remove the screws from the back of the case
4. remove the side panel

2.2 Unordered

- Apples
- Oranges
- Strawberries
- Blueberries

3 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

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

A set of differential equations!

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

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

$$\frac{dz}{dt} = xy - \beta z \tag{4}$$

4 Figures

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

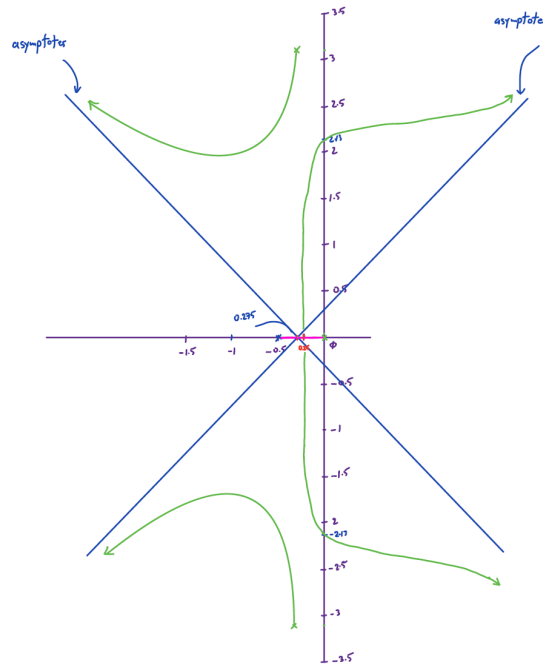


Figure 1: A test figure

5 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 | -14.20 |
| Gain | ≥ 16 | ≥ -3.26 | -4.58 |
| I_{bias}/mA | | | |
| I_{buf}/mA | | | |
| I_{ref}/mA | | 1 | 1 |
| R_D/Ω | ≤ 10 | 570 | 600 |
| V_{lo}/V | ≤ 1 | | |
| V_{rf}/V | ≤ 1 | | |

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

6 In-document References

References to items in your document is handled using two parts. A label inserted with the `\label{<your label>}` command, and the `\ref{<your label>}` command. With it, you can refer to equations like the Fourier transform from earlier (Equation 1), or a figure (Figure 1), table (Table 5), or any of the many things with automatic counters.

7 Bibliographies

7.1 Citations

Citations are inserted using the `\cite{<your reference>}`. 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. `\usepackage[style=ieee,backend=biber]{biblatex}`

7.2 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 1: 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 The Power of Open Source

- Widely available and extraordinarily flexible
- Enormous and extremely helpful user base - debugging less of an exercise in pulling teeth
 - CTAN - Comprehensive TeX Archive Network
 - TeX Stack Exchange
 - Overleaf guides
- Continuous extension via community created packages

8.1 Recommended Packages

8.1.1 siunitx

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

Hz

100 nm to 200 nm

100 kg

Convenient!

8.1.2 csvsimple

Ease preparation of tables by importing csv files directly

8.1.3 chemformula

A chemical (or nuclear) equation!



8.1.4 Much More to Discuss Next Time!

8.1.5 minted

Include blocks of code or source files with syntax highlighting.

```

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

9 As For Modularity and Reusability...

9.1 Preamble Starting Point

1. import
2. geometry
3. hyperref
4. amsmath
5. amsfons
6. amssymb
7. inputenc
8. fontenc
9. biblatex
10. float
11. graphicx
12. booktabs
13. csvsimple
14. siunitx
15. minted
16. chemformula

```
\usepackage{import}  
\usepackage{geometry}  
\usepackage{hyperref}  
\usepackage[tbtags]{amsmath}  
\usepackage{amsfons}  
\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}
```

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.