

# Hello L<sup>A</sup>T<sub>E</sub>X

An Introduction to the  
Typesetting Tool

Authors and Organizers:  
Ghassan Arnouk  
Alec Bales D'Cruze  
Aaron English  
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# 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. `amssfonts`
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

```
1 \usepackage{import}
2 \usepackage{geometry}
3 \usepackage{hyperref}
4 \usepackage[tbtags]{ansnath}
5 \usepackage{ansfonts}
6 \usepackage{anssynb}
7 \usepackage[utf8]{inputenc}
8 \usepackage[T1]{fontenc}
9 \usepackage[style=ieee, backend=biber]{biblatex}
10 \usepackage{float}
11 \usepackage{graphicx}
12 \usepackage{booktabs}
13 \usepackage{csvsimple}
14 \usepackage{siunitx}
15 \usepackage{minted}
16 \usepackage{chemformula}
```

Listing 1: Code to include packages in a L<sup>A</sup>T<sub>E</sub>X document (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!

$$\frac{dx}{dt} = \sigma(y - x) \tag{1}$$

$$\frac{dy}{dt} = x(\rho - z) - y \tag{2}$$

$$\frac{dz}{dt} = xy - \beta z \tag{3}$$

An example with an integral, the Fourier Transform

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

## 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\**

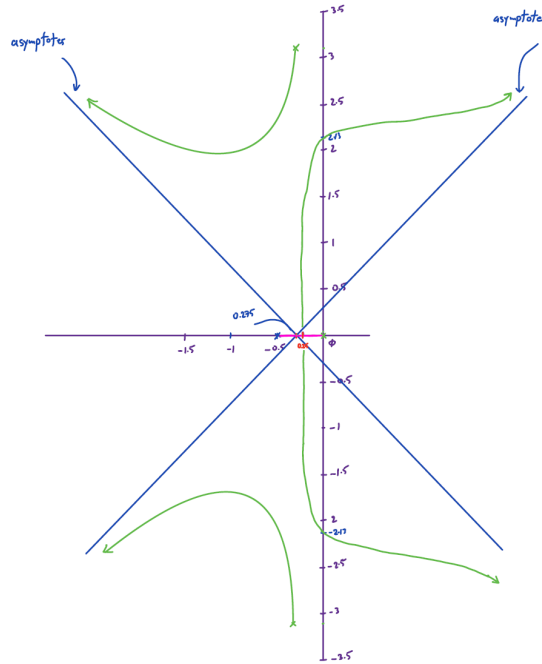


Figure 1: A test figure

## 6 Tables

What are tables like? Like this!

Table 1: Table of specified parameters and achieved values

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

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

## 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

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

- chemformula  
A chemical (or nuclear) equation!





## 8 Bibliography

### 8.1 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/xcom$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](https://physics.nist.gov/cgi-bin/Xcom/xcom3_1).