



上海交通大学

SHANGHAI JIAO TONG UNIVERSITY

现在的大学生 放个屁都要写 实验报告

*An Experimental Investigation into
a Single Gas Emission Event*

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July 31, 2026

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Exercise 1.2

Solution: $x = 1$.

Use exercise environment to create a new exercise for your homework.

Problem 6.5 在报告中包含该 DC 扫描的结果，并简要分析输入输出关系。

这是一个典型的 CMOS 反相器的输入输出关系曲线。当输入低电平时，输出高电平；当输入高电平时，输出低电平。而当输入电压位于两个阈值之间时，nMOS 与 pMOS 工作在饱和区，可得到较大的增益。

1 实验内容

电路如图 1 所示。利用 Multisim 分析下列问题：

- 选择合适的 R_f 和稳压管，使电路产生正弦波振荡，并观察起振过程；
- 调整电路参数，使输出电压峰值约为 14 V；
- 测量输出电压的频率和幅值。

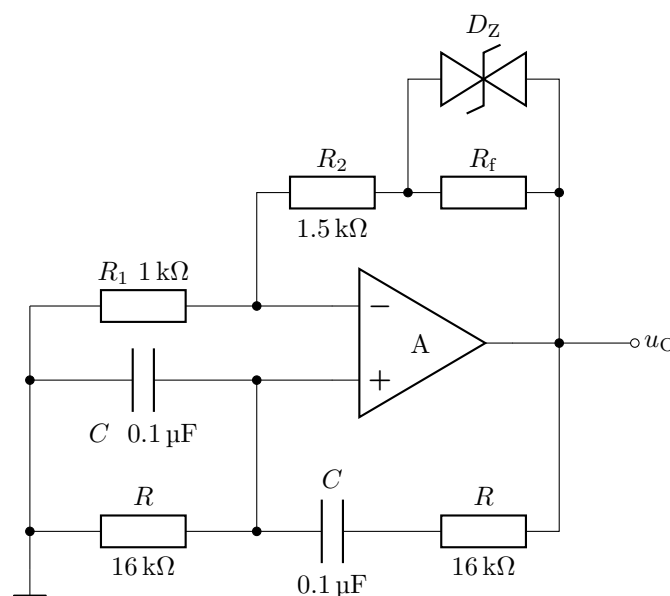


Figure 1: 研究的正弦波振荡电路

2 Custom Environments

2.1 Blocks

Algorithm 1: FastTwoSum

Input: (a, b) , two floating-point numbers**Result:** (c, d) , such that $a + b = c + d$ **if** $|b| > |a|$ **then** exchange a and b ;**end** $c \leftarrow a + b$; $z \leftarrow c - a$; $d \leftarrow b - z$;**return** (c, d) ;

file.txt

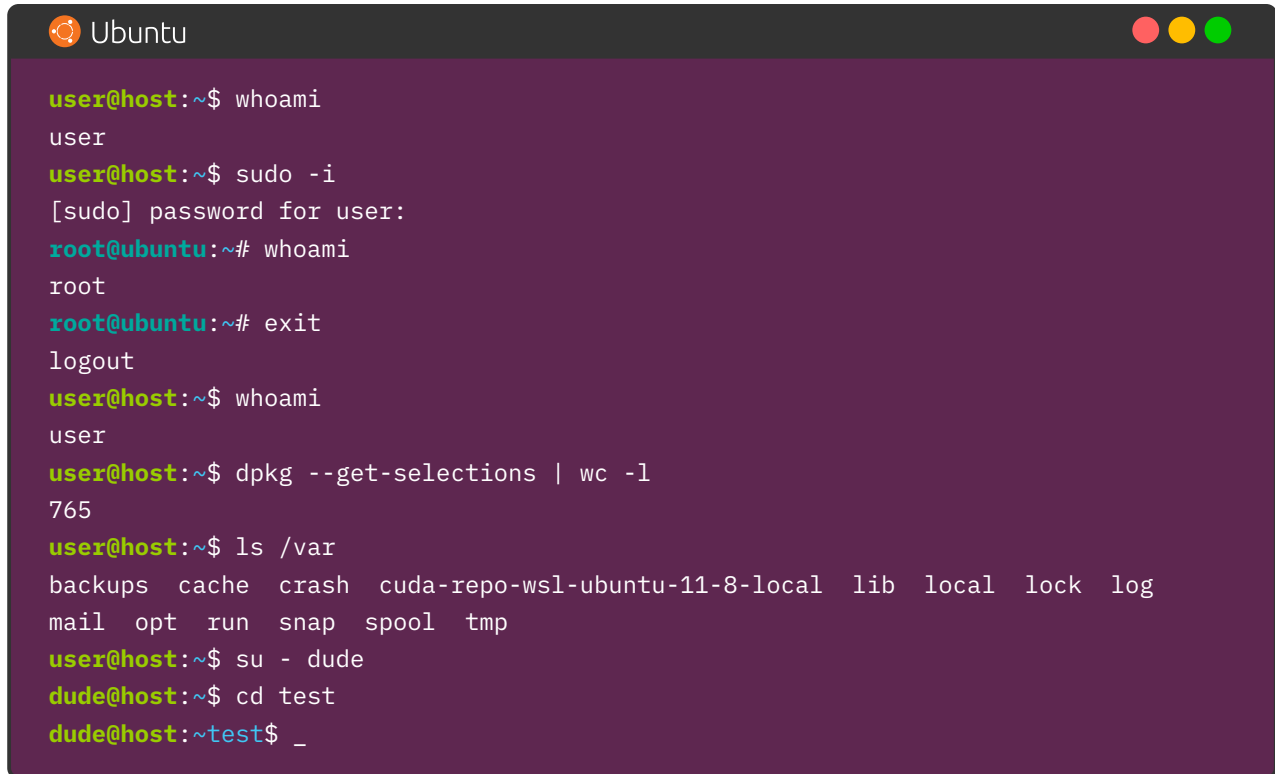
```
# Copyright (c) 1993-2009 Microsoft Corp.
#
# This is a sample HOSTS file used by Microsoft TCP/IP for Windows.
#
# This file contains the mappings of IP addresses to host names. Each
# entry should be kept on an individual line. The IP address should
# be placed in the first column followed by the corresponding host name.
# The IP address and the host name should be separated by at least one
# space.
#
# Additionally, comments (such as these) may be inserted on individual
# lines or following the machine name denoted by a '#' symbol.
```

Question 1: Subnautica

Descend into the depths of an alien underwater world filled with wonder and peril. Craft equipment, pilot submarines and out-smart wildlife to explore lush coral reefs, volcanoes, cave systems, and more - all while trying to survive.

2.2 Command Line

Username defaults to “user”. `\UbuntuPrompt` will create an Ubuntu terminal prompt.



```
Ubuntu
user@host:~$ whoami
user
user@host:~$ sudo -i
[sudo] password for user:
root@ubuntu:~# whoami
root
root@ubuntu:~# exit
logout
user@host:~$ whoami
user
user@host:~$ dpkg --get-selections | wc -l
765
user@host:~$ ls /var
backups  cache  crash  cuda-repo-wsl-ubuntu-11-8-local  lib  local  lock  log
mail  opt  run  snap  spool  tmp
user@host:~$ su - dude
dude@host:~$ cd test
dude@host:~test$ _
```

2.3 Ref Lists



Task: 别有世间曾未见，一行一步一花新。欢迎来到亦真亦幻的东方魔幻世界！你将扮演一位“天命人”，为了探寻昔日传说的真相，踏上一条充满危险与惊奇的西游之路。



Warning: I’ve learned that our choices always matter, to someone, somewhere. And sooner or later, in ways we cannot always fathom, the consequences come back to us.



Observation: You struggle against prophecy like a stone loose from its sling. How thrilling the launch, how breath taking the apex, and how terrifying the descent, as gravity drags you down into inevitable.



Hint: September 30th, 1998. It's a day I'll never forget. If I could just forget what happened that night - the pain, even for a second? This time, it can be different. It has to.

2.4 Github Flavoured Alerts

Note

Highlights information that users should take into account, even when skimming.

Tip

Optional information to help a user be more successful.

Important

Crucial information necessary for users to succeed.

Warning

Critical content demanding immediate user attention due to potential risks.

Caution

Negative potential consequences of an action.

3 Fusce eleifend porttitor arcu, id accumsan elit pharetra eget

Lorem ipsum dolor sit amet, consectetur adipiscing elit. ¹

¹ Section, subsection and subsubsection titles can span multiple lines, as shown here. Make sure to put a shorter version of these long titles in the optional parameter to the section commands so the title output to the table of contents is the short version.

3.1 Phasellus sit amet enim efficitur, aliquam nulla id, lacinia mauris viverra libero ac magna

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

3.1.1 In mi mauris, finibus non faucibus non, imperdiet nec leo. In erat arcu, tincidunt nec aliquam et, volutpat eget

Lorem ipsum dolor sit amet, consectetur adipiscing elit.

4 Font Examples

4.1 Font Sizes

极小\tiny 上下标尺寸\scriptsize 脚注尺寸\footnotesize

小\small 正常\normalsize² 大\large

较大\Large 更大\LARGE 很大\huge 巨大\Huge

4.2 Font Families

非衬线体 Sans Text

衬线字体³ Serif Text

等宽字体 Mono Text

4.3 Font Weights

ExtraLight 极细 Light 细 Normal 常规 SemiBold 半粗 Bold 粗

² The default font size for the document is 12pt, represented by \normalsize. The standard LaTeX font size commands modify this to be smaller or larger as needed.

³ 中文衬线字体使用的即为中文斜体字体思源宋体。

5 Quotations

“*The only universal language in the world is violence.*”

— Alexander “Technoblade”, 1999-2022

“

对大学生要有效“增负”，要提升大学生的学业挑战度，合理增加课程难度，拓展课程深度，扩大课程的可选择性，真正把“水课”转变成有深度、有难度、有挑战度的“金课”。”

— 《建设中国“金课”》，中国大学教学, 2018 年第 12 期

6 Table Examples

This statement automatically references the table below using its label: Table 1.

Table 1: Text block table caption.

Prospect	Industry	Revenue
Gerlach Inc	Business Development	\$3M
Doyle and Sons	Law	\$1M
Heathcote Group	Consulting	\$12M
Goyette Inc	Advertising	\$5M
Holzdeppe GmbH	Manufacturing	\$23M
Bienias AG	Accounting	\$2.5M

Table 2: Full width table caption.

#	Prospect	Industry	Revenue	Employees
1	Gerlach Inc	Business Development	\$3M	65
2	Doyle and Sons	Law	\$1M	15
3	Heathcote Group	Consulting	\$12M	250
4	Goyette Inc	Advertising	\$5M	100
5	Holzdeppe GmbH	Manufacturing	\$23M	75
6	Bienias AG	Accounting	\$2.5M	40

Table 3: Complex table with multiple rows and columns.

Tools	Action	Shortcut	Description
FileTools	¹ fileNew	Ctrl + N	新建文件
	² fileOpen	Ctrl + O	打开文件
	³ fileSave	Ctrl + S	保存文件
EditTools	⁴ copy	Ctrl + C	复制
	⁵ cut	Ctrl + X	剪切
	⁶ paste	Ctrl + V	粘贴
SimulateTools	⁷ simulate	Ctrl + R	运行仿真，并输出仿真结果
DebugTools	⁸ parse	Ctrl + Shift + P	解析电路，将解析结果 输出到控制台
	⁹ debug	F11	运行调试，在进行电路仿真 同时额外打印调试信息

Use `\resizebox` to avoid Overfull \hbox warnings when the table is too wide.

Table 4: 各模块资源利用情况

Module Inst Name	LUT	FF	Distributed RAM	APM	DRM	HSST	IO	USCM
voice_process_top	22610	32347	1308	35	121.5	1	134	13
pcie	4802	3318	1132	0	52.5	1	0	0
u_aec	5078	16635	0	16	1.0	0	0	0

7 Figure Examples

This statement automatically references the figure below using its label: Figure 2.

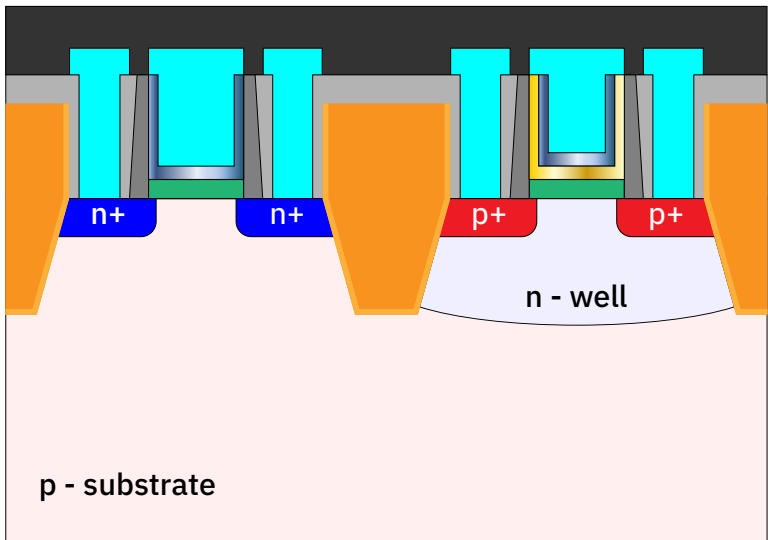


Figure 2: Example figure.

Use `\protect\footnotemark` to add a footnote to some special place.

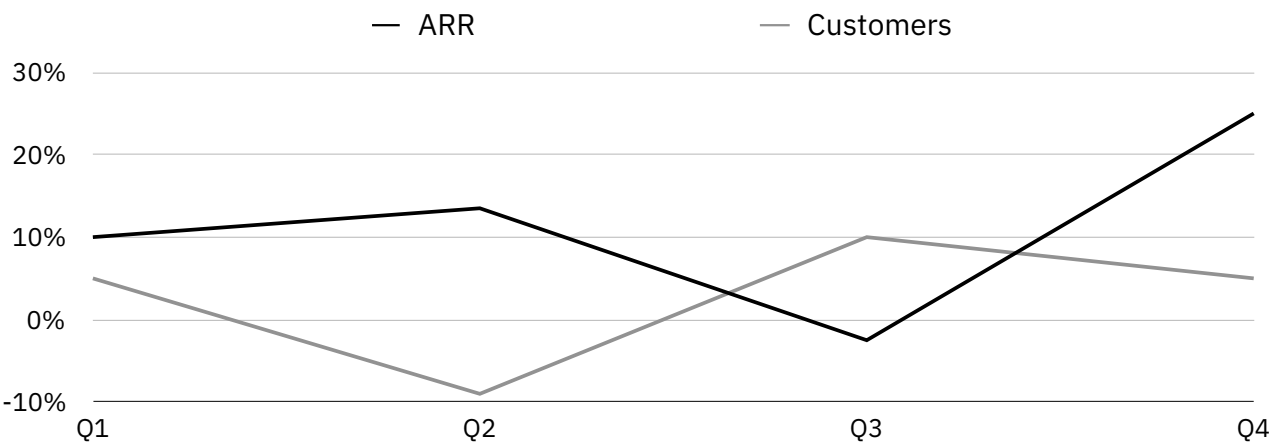


Figure 3: Figure caption⁴.

subcaption package can be used to create subfigures, as shown in figure 4.



Figure 4: Science Companies

⁴ This is a footnote in the figure caption.

8 List Examples

8.1 Bullet Point List

- First bullet point item
 - First indented bullet point item
 - Second indented bullet point item
 - First second-level indented bullet point item
 - Second second-level indented bullet point item
 - Third indented bullet point item
- Second bullet point item
- Third bullet point item

Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in. Nunc fermentum nisi imperdiet lectus tincidunt vestibulum at ac elit. Nulla mattis nisl eu malesuada suscipit.

8.2 Numbered List

- (1) First numbered item
 - a. First indented numbered item
 - b. Second indented numbered item
 - i. First second-level indented numbered item
 - ii. Second second-level indented numbered item
 - c. Third indented numbered item
- (2) Second numbered item
- (3) Third numbered item

Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in. Nunc fermentum nisi imperdiet lectus tincidunt vestibulum at ac elit. Nulla mattis nisl eu malesuada suscipit.

8.3 Description List

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Praesent porttitor arcu luctus, imperdiet urna iaculis, mattis eros. Pellentesque iaculis odio vel nisl ullamcorper, nec faucibus ipsum molestie. Sed dictum nisl non aliquet porttitor.

Item One Lorem ipsum dolor sit amet, consectetur adipiscing elit. Praesent porttitor arcu luctus, imperdiet urna iaculis, mattis eros. Pellentesque iaculis odio vel nisl ullamcorper, nec faucibus ipsum molestie.

Item Two Sed dictum nisl non aliquet porttitor.

Subitem Maecenas consectetur metus at tellus finibus condimentum. Proin arcu lectus, ultrices non tincidunt et, tincidunt ut quam. Integer luctus posuere est, non maximus ante dignissim quis.

Subsubitem Maecenas consectetur metus.

Item Three Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in. Nunc fermentum nisi imperdiet lectus tincidunt vestibulum at ac elit. Nulla mattis nisl eu malesuada suscipit.

Etiam vulputate arcu dignissim, finibus sem et, viverra nisl. Aenean luctus congue massa, ut laoreet metus ornare in.

9 Referencing Citations

This statement requires citation [1].

This statement requires multiple citations [1, 2].

This statement requires citation^[1] displayed as a superscript.

10 Link Examples

This is a URL link: DuckDuckGo.⁵

This is a email link: example@example.com.

⁵ Links can be clicked in the PDF to navigate to the linked website or email address.

This is a monospaced URL link: `https://duckduckgo.com`.

11 Math Examples

11.1 Numbers and Units

Package `siunitx` is used to typeset numbers and units.

- 12 345.678 90
- $1 \pm 2i$
- 0.3×10^{45}
- $1.654 \times 2.34 \times 3.430$
- kg m s^{-1}
- $\mu\text{m } \mu\text{m}$
- $\Omega \Omega$
- 10 and 20
- 10, 20 and 30
- 0.13 mm, 0.67 mm and 0.80 mm
- 10 ~ 20
- 10 °C ~ 20 °C

11.2 Equation

This statement automatically references the equation above using its label: Equation (1).
Use `\eqref{eq:example}`, not `\ref{eq:example}` to reference an equation.

$$\cos^3 \theta = \frac{1}{4} \cos \theta + \frac{3}{4} \cos 3\theta \quad (1)$$

`aligned` environment can be used to align multiple equations, it is recognized as a single equation.

$$\begin{aligned}
 P(y|x;w,b) &= \prod_{i=1}^m P(y^{(i)}|x^{(i)};w,b) \\
 &= \prod_{i=1}^m (\hat{y}^{(i)})^{y^{(i)}} (1 - \hat{y}^{(i)})^{1-y^{(i)}}
 \end{aligned} \tag{2}$$

`align` environment can be used to align multiple equations, every line will be numbered.

$$\frac{dJ}{dZ^{[l]}} = g^{[l]'}(Z^{[l]}) \odot \frac{dJ}{dA^{[l]}} \tag{3}$$

$$\frac{dJ}{dA^{[l-1]}} = W^{[l]T} \frac{dJ}{dZ^{[l]}} \tag{4}$$

$$\frac{dJ}{dW^{[l]}} = \frac{dJ}{dZ^{[l]}} A^{[l-1]T} \tag{5}$$

$$\frac{dJ}{db^{[l]}} = \sum_{i=1}^m \frac{dJ}{dz^{[l](i)}} \tag{6}$$

`iRow` and `jCol` are counters for rows and columns, provided by `nicematrix` package.

$$C = \begin{pmatrix} C_{1,1} & C_{1,2} & C_{1,3} \\ C_{2,1} & C_{2,2} & C_{2,3} \\ C_{3,1} & C_{3,2} & C_{3,3} \end{pmatrix} \tag{7}$$

Equation (8) is a complex equation with multiple annotations, powered by `annotate-equations` package.

$$\begin{aligned}
 &\text{size of set of allowed interventions} \\
 &\text{\# of nodes} \\
 &\text{\# of samples per batch} \\
 &\text{\# of graphs in } \hat{\mathcal{G}}_T \\
 &\text{\# of samples for } \mathbb{E}_y \\
 &\text{max. indegree in } \hat{\mathcal{G}}_T
 \end{aligned}
 \mathcal{O}((p \kappa^3 T + (p \kappa)(T^2 |\mathcal{I}^*| N_b M))) \tag{8}$$

12 Displaying Code

12.1 Inline Code

This is some wrapped `inline code stuff` shown in a box similar to markdown. The string in `\code{}` will be shown as is.

Inline code also supports auto line breaking. You can use long inline code like `l1 = always_redraw(lambda: Line(start=c.get_center(), end=c.get_bottom(), stroke_color=RED_B, stroke_width=10))`.

12.2 Code Listings

The block below is a code listing. It displays code in an easy to use way with line numbers for quick reference to specific parts of the code. Parentheses, brackets, and braces are automatically colored depending on their levels.

MATLAB Code for Check

```
1 A = [1, -3, 3; 3, -5, 3; 6, -6, 4]; % define the matrix A
2 inv(A) % calculate and print the inverse of A
3 det(A) % the determinant of A
4 rank(A) % the rank of A
5 trace(A) % the trace of A
6 A + A.' % the sum of A and the transpose of A
7 sum(sum(A * A.' ~= eye(3))) % check if A is orthogonal
8 [X, D] = eig(A) % the eigenvectors and the corresponding eigenvalues of A
9 sum(sqrt(sum(A.^2))) % l-2,1 norm of A
10 norm(A, 'fro') % Frobenius norm of A
11 sum(svd(A)) % nuclear norm of A
12 max(svd(A)) % spectral norm of A
```

Code listing's caption/title is optional. Below is some python code without a title.

```
1 def factorial(n):
2     """Return the factorial of n, an exact integer >= 0."""
3     if n == 0:
4         return 1
5     else:
6         return n * factorial(n-1)
7
8 arr = np.array([1, 2, 3], [4, 5, 6], [7, 8, 9])
```

```
9
10 string = "(=_) -> Hello, World!"
11
12 numbers = [factorial(i) for i in range(10)]
13
14 mapping = {number: number**2 for number in numbers}
15
16 print(mapping)
```

If you want to reference a code listing, you can use the `\ref{lst:xxx}` to reference it. For example, see code listing 1. In this case, do not specify the `title` of the code listing, use `caption` instead, or it may generate a duplicate label.

Listing 1: Fixed-Point Multiplier

```
1 `define SIMULATION
2
3 wire signed [CACHE_W-1:0] temp_data;
4
5 // Saturate
6 parameter signed [CACHE_W-1:0] CEILING
7     = ((1 << (DO_IL_W + DO_FL_W)) - 1) << (CACHE_FL_W - DO_FL_W);
8 parameter signed [CACHE_W-1:0] FLOOR
9     = -(1 << (DO_IL_W + DO_FL_W)) << (CACHE_FL_W - DO_FL_W);
10 assign temp_data
11     = (data_in > CEILING)? CEILING : (data_in < FLOOR)? FLOOR : data_in;
12
13 // Truncate
14 always @(posedge clk or negedge rst_n) begin
15     if (~rst_n) begin
16         data_out <= 0;
17     end else begin
18         data_out <= temp_data >>> (CACHE_FL_W - DO_FL_W);
19     end
20 end
```

13 Horizontal Rules

Use the `\mdsimplehrule` command to create a simple horizontal rule.

Use the `\mdfancyhrule` command to create a fancy horizontal rule.

////////////////////////////////////

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Appendices

A Appendix Section

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam auctor mi risus, quis tempor libero hendrerit at. Duis hendrerit placerat quam et semper. Nam ultricies metus vehicula arcu viverra, vel ullamcorper justo elementum. Pellentesque vel mi ac lectus cursus posuere et nec ex. Fusce quis mauris egestas lacus commodo venenatis. Ut at arcu lectus. Donec et urna nunc. Morbi eu nisl cursus sapien eleifend tincidunt quis quis est. Donec ut orci ex. Praesent ligula enim, ullamcorper non lorem a, ultrices volutpat dolor. Nullam at imperdiet urna. Pellentesque nec velit eget euismod pretium.

B Appendix Section

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aliquam auctor mi risus, quis tempor libero hendrerit at. Duis hendrerit placerat quam et semper. Nam ultricies metus vehicula arcu viverra, vel ullamcorper justo elementum. Pellentesque vel mi ac lectus cursus posuere et nec ex. Fusce quis mauris egestas lacus commodo venenatis. Ut at arcu lectus. Donec et urna nunc. Morbi eu nisl cursus sapien eleifend tincidunt quis quis est. Donec ut orci ex. Praesent ligula enim, ullamcorper non lorem a, ultrices volutpat dolor. Nullam at imperdiet urna. Pellentesque nec velit eget euismod pretium.