

Making pretty figures in MATLAB

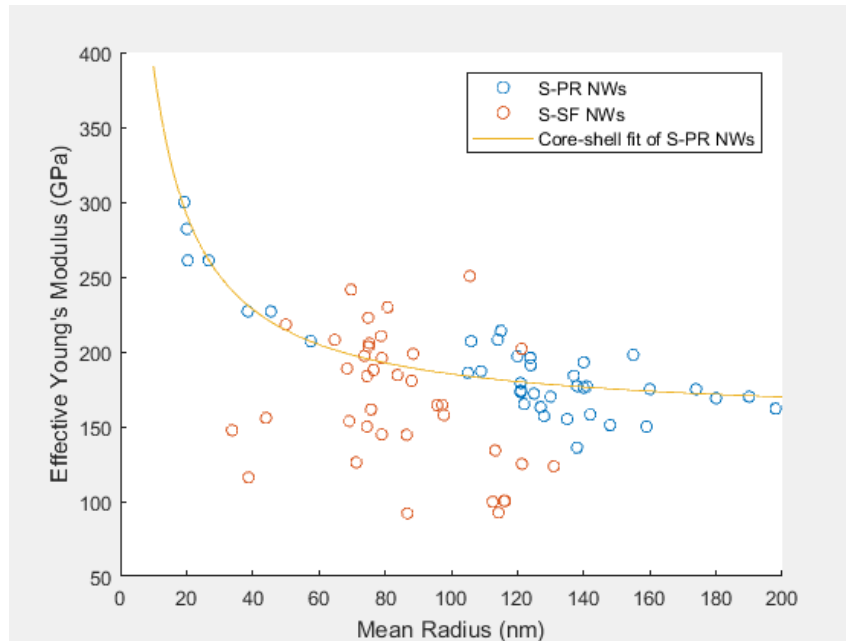
Edmund Pickering

Resources and code: <http://bit.ly/2QKwe20>

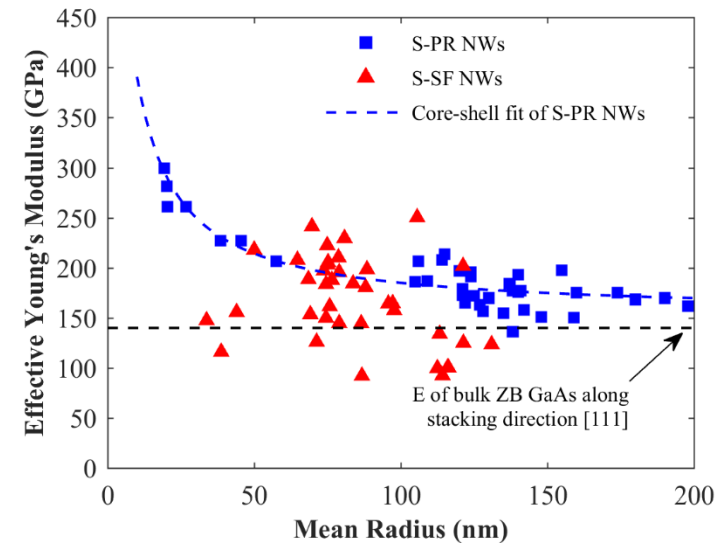
WHY DO
WE CARE?

Objective

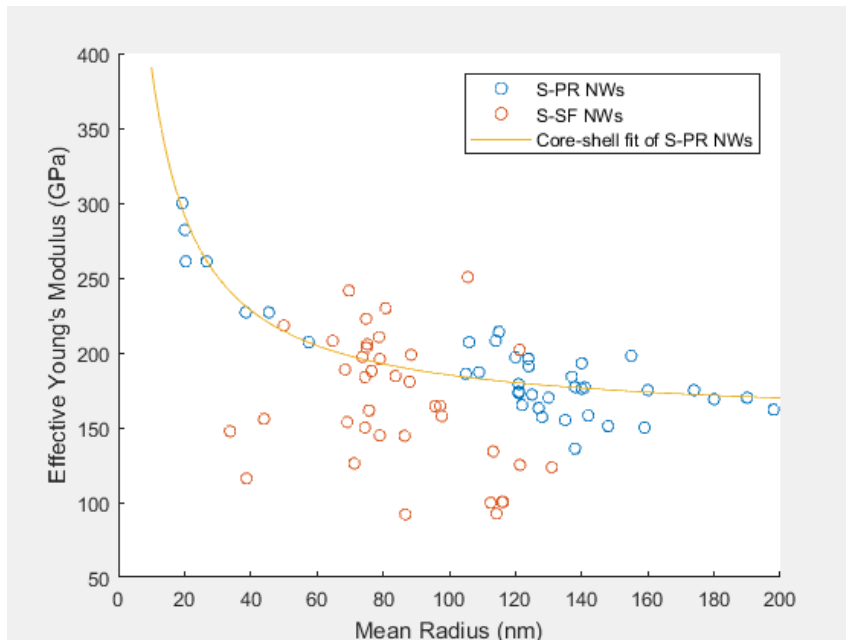
From this



To this



Snipping ☹️



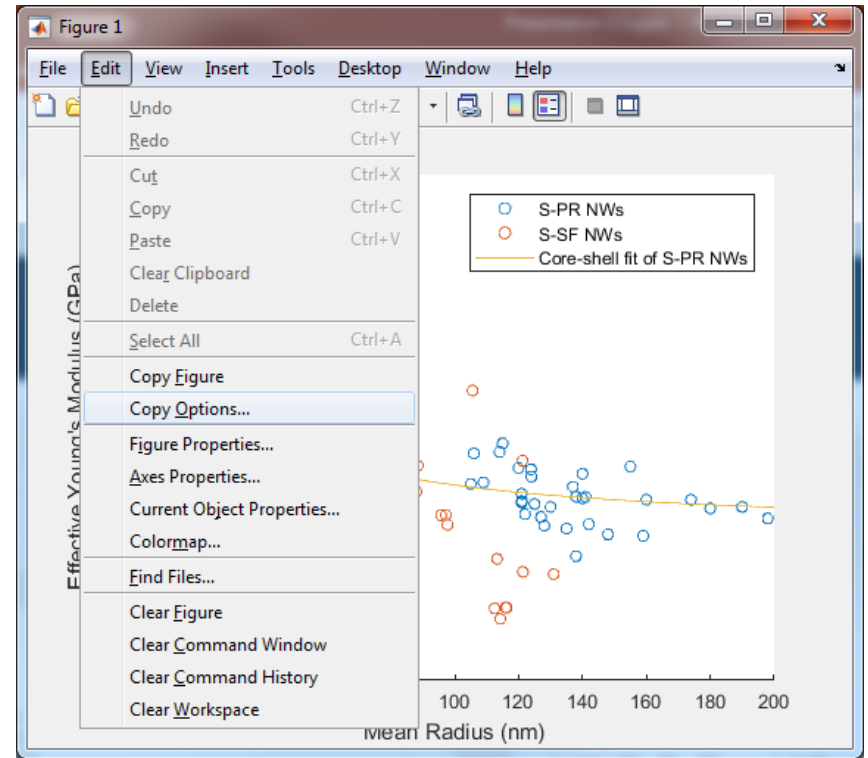
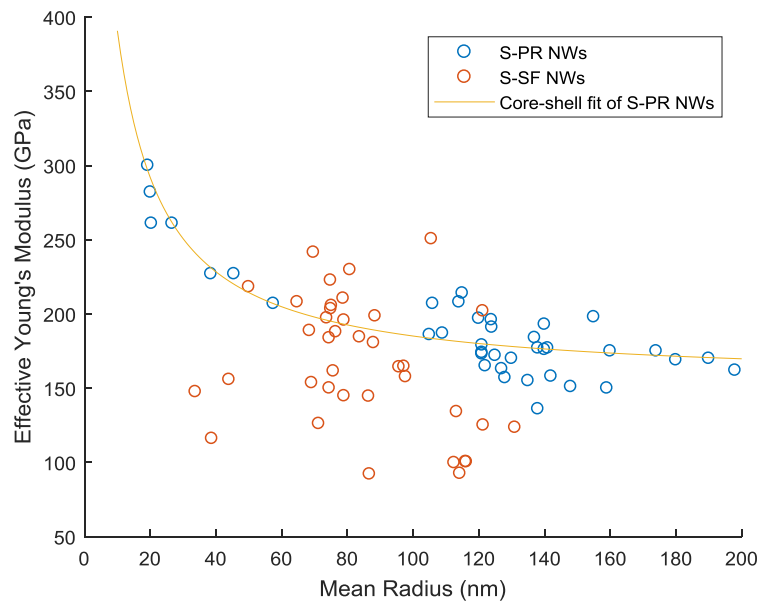
```
clear all
close all
clc

load('matlab.mat')

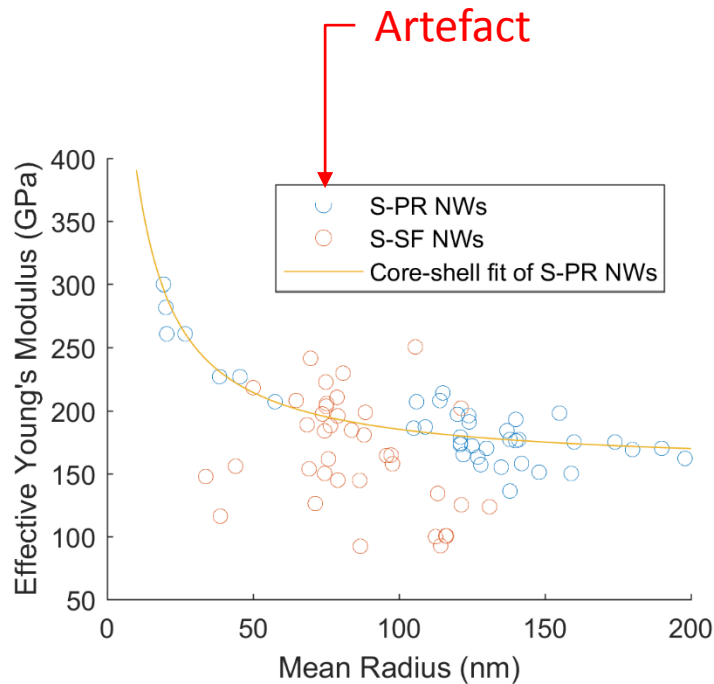
%% Plots
hold on
scatter(X1, Y1)      % S-PR resonance
scatter(X2, Y2)      % resonance stacking fault
plot(X3, Y3)         % S-PR resonance (fit)

%% Annotations
legend('S-PR NWs', 'S-SF NWs', 'Core-shell fit of S-PR NWs');
xlabel('Mean Radius (nm)');
ylabel('Effective Young's Modulus (GPa)');
```

Better ☹



Exact sizing, resolution, file type



Use common aspect ratios. Think about golden rectangles

```
clear all
close all
clc

load('matlab.mat')

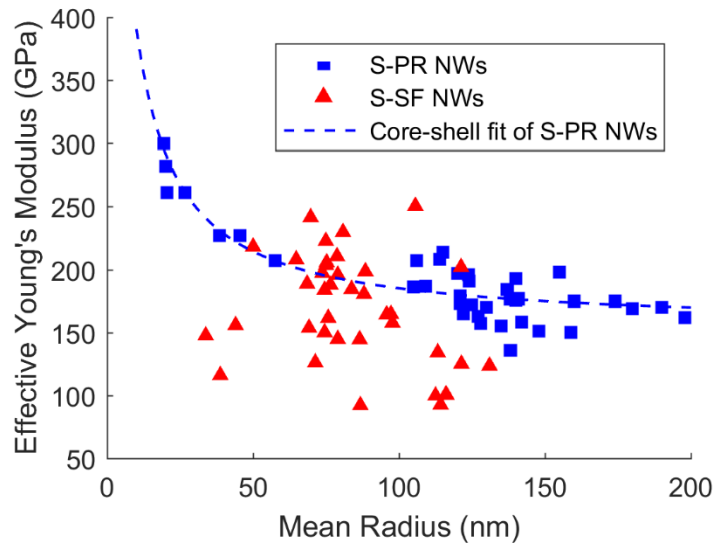
%% Plots
hold on
scatter(X1, Y1)      % S-PR resonance
scatter(X2, Y2)      % resonance stacking fault
plot(X3, Y3)         % S-PR resonance (fit)

%% Annotations
legend('S-PR NWs', 'S-SF NWs', 'Core-shell fit of S-PR NWs');
xlabel('Mean Radius (nm)');
ylabel('Effective Young's Modulus (GPa)');

%% setup and export figure
set(gcf, 'PaperUnits', 'centimeters', 'PaperPosition', [0 0 10 10*3/4])
print(gcf, '-depsc', [mfilename '.eps'])
print(gcf, '-dtiff', '-r300', [mfilename '.tif'])
```

gcf – shorthand for current figure
mfilename – shorthand for filename
eps – Vector file, useful for latex or for edits (e.g. photoshop)

Plot colours and markers



```
clear all
close all
clc

load('matlab.mat')

%% Plots
hold on
scatter(X1, Y1, 'b', 'filled', 'square') % S-PR resonance
scatter(X2, Y2, 'r', 'filled', '^') % resonance stacking fault
plot(X3, Y3, '--', 'LineWidth', 1, 'color', 'b') % S-PR resonance (fit)

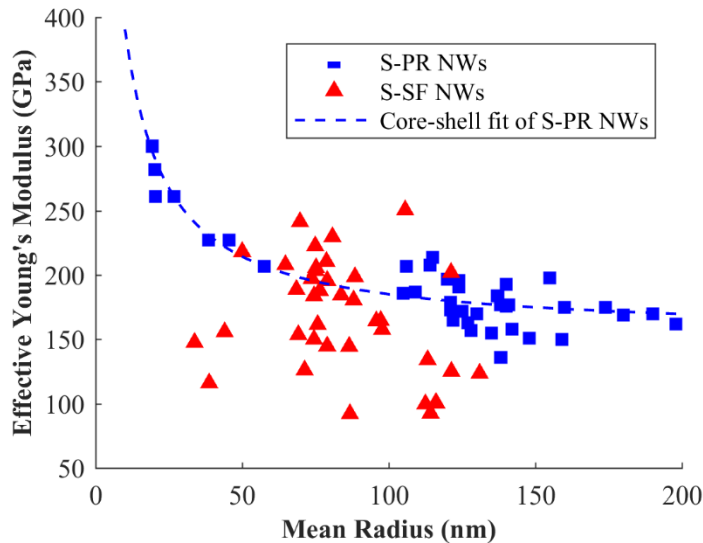
%% Annotations
legend('S-PR NWs', 'S-SF NWs', 'Core-shell fit of S-PR NWs');

xlabel('Mean Radius (nm)');
ylabel('Effective Young's Modulus (GPa)');

%% setup and export figure
set(gcf, 'PaperUnits', 'centimeters', 'PaperPosition', [0 0 10 10*3/4])
print(gcf, '-depsc', [mfilename '.eps'])
print(gcf, '-dtiff', '-r300', [mfilename '.tif'])
```

- Use high contrast colours (red, blue, green, aqua)
- Use markers and line style so plot is distinguishable when printed in black and white (also consider colour blind persons (e.g. red-green colour blind))

Fonts



Font size for plot, then for specific elements.
gca – refers to current axes

```
clear all
close all
clc

load('matlab.mat')

%% Plots
hold on
scatter(X1, Y1, 'b', 'filled', 'square') % S-PR resonance
scatter(X2, Y2, 'r', 'filled', '^') % resonance stacking
fault
plot(X3, Y3, '--', 'LineWidth', 1, 'color', 'b') % S-PR resonance
(fit)

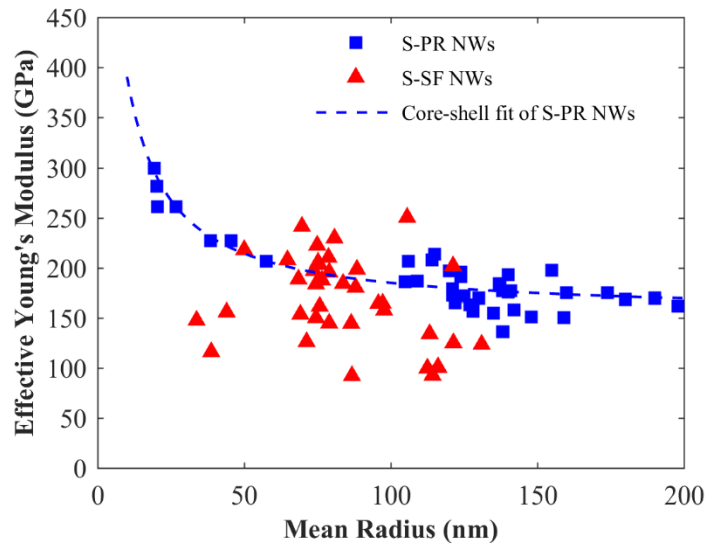
%% Annotations
legend('S-PR NWs', 'S-SF NWs', 'Core-shell fit of S-PR NWs');

%% Formatting
set(gca, 'FontName', 'Times New Roman', 'FontSize', 10)
xlabel('Mean Radius (nm)', 'FontName', 'Times New
Roman', 'FontSize', 10, 'FontWeight', 'B');
ylabel('Effective Young's Modulus (GPa)', 'FontName', 'Times New
Roman', 'FontSize', 10, 'FontWeight', 'B');

%% setup and export figure
set(gcf, 'PaperUnits', 'centimeters', 'PaperPosition', [0 0 10
10*3/4])
print(gcf, '-depsc', [mfilename '.eps'])
print(gcf, '-dtiff', '-r300', [mfilename '.tif'])
```

- Set exact font size.
- Prefer serif fonts like *Times New Roman* or *CMU Modern*.
- The mind subconsciously associates serif fonts with academic work.
- Match font to journal.

Symmetry & Other formatting



- Symmetry is more pleasant to the eye

```
clear all
close all
clc

load('matlab.mat')

%% Plots
hold on
scatter(X1, Y1, 'b', 'filled', 'square') % S-PR resonance
scatter(X2, Y2, 'r', 'filled', '^') % resonance stacking fault
plot(X3, Y3, '--', 'LineWidth', 1, 'color', 'b') % S-PR resonance (fit)

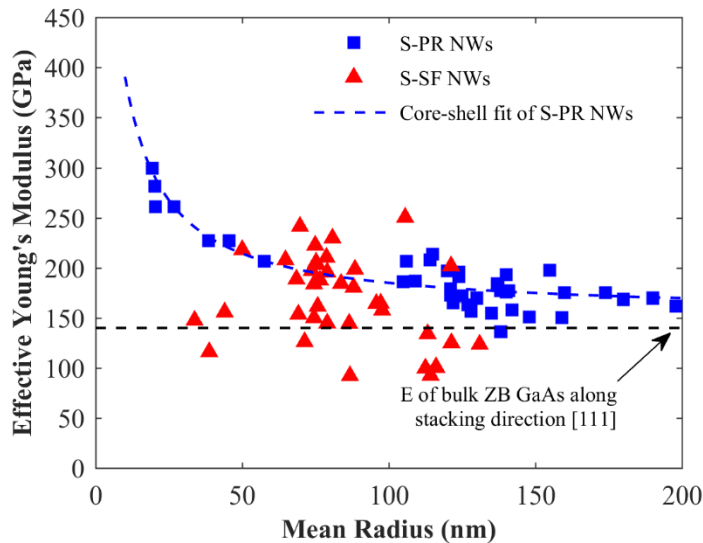
%% Annotations
leg = legend('S-PR NWs', 'S-SF NWs', 'Core-shell fit of S-PR NWs');
set(leg, 'FontName', 'Times New Roman', 'FontSize', 8, 'Position', [0.53 0.72 0.2 0.2])

%% Formatting
box on
legend('boxoff')
ylim([0 450])
xlim([0 200])

set(gca, 'FontName', 'Times New Roman', 'FontSize', 10)
xlabel('Mean Radius (nm)', 'FontName', 'Times New Roman', 'FontSize', 10, 'FontWeight', 'B');
ylabel('Effective Young's Modulus (GPa)', 'FontName', 'Times New Roman', 'FontSize', 10, 'FontWeight', 'B');

%% setup and export figure
set(gcf, 'PaperUnits', 'centimeters', 'PaperPosition', [0 0 10 10*3/4])
print(gcf, '-depsc', [mfilename '.eps'])
print(gcf, '-dtiff', '-r300', [mfilename '.tif'])
```

Additional Annotations



- Use annotations to make your plot easy to interpret

```
clear all
close all
clc

load('matlab.mat')

%% Plots
hold on
scatter(X1, Y1, 'b', 'filled', 'square') % S-PR resonance
scatter(X2, Y2, 'r', 'filled', '^') % resonance stacking fault
plot(X3, Y3, '--', 'LineWidth', 1, 'color', 'b') % S-PR resonance (fit)

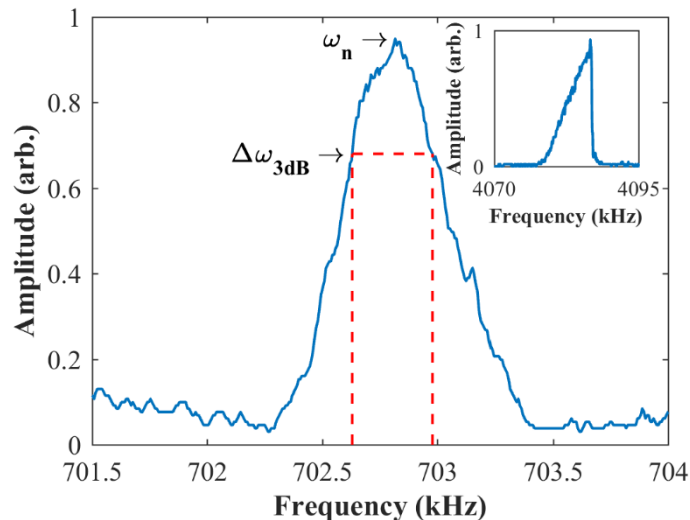
%% Annotations
plot([0 200], [140 140], '--', 'LineWidth', 1, 'color', 'black') % bottom
lines for theoretical
annotation('textarrow', [0.82 0.89], [0.285 0.37], 'String', {'E of bulk ZB
GaAs along', 'stacking direction [111]'}, 'FontName', 'Times New Roman',
'fontSize', 8, 'HeadLength', 7, 'HeadWidth', 7)
leg = legend('S-PR NWs', 'S-SF NWs', 'Core-shell fit of S-PR NWs');
set(leg, 'FontName', 'Times New Roman', 'FontSize', 8, 'Position', [0.53 0.72
0.2 0.2])

%% Formating
box on
legend('boxoff')
ylim([0 450])
xlim([0 200])

set(gca, 'FontName', 'Times New Roman', 'FontSize', 10)
xlabel('Mean Radius (nm)', 'FontName', 'Times New
Roman', 'FontSize', 10, 'FontWeight', 'B');
ylabel('Effective Young's Modulus (GPa)', 'FontName', 'Times New
Roman', 'FontSize', 10, 'FontWeight', 'B');

%% setup and export figure
set(gcf, 'PaperUnits', 'centimeters', 'PaperPosition', [0 0 10 10*3/4])
print(gcf, '-depsc', [mfilename 'eps'])
print(gcf, '-dtiff', '-r300', [mfilename 'tif'])
```

Additional Annotations



Can add our own inset axes

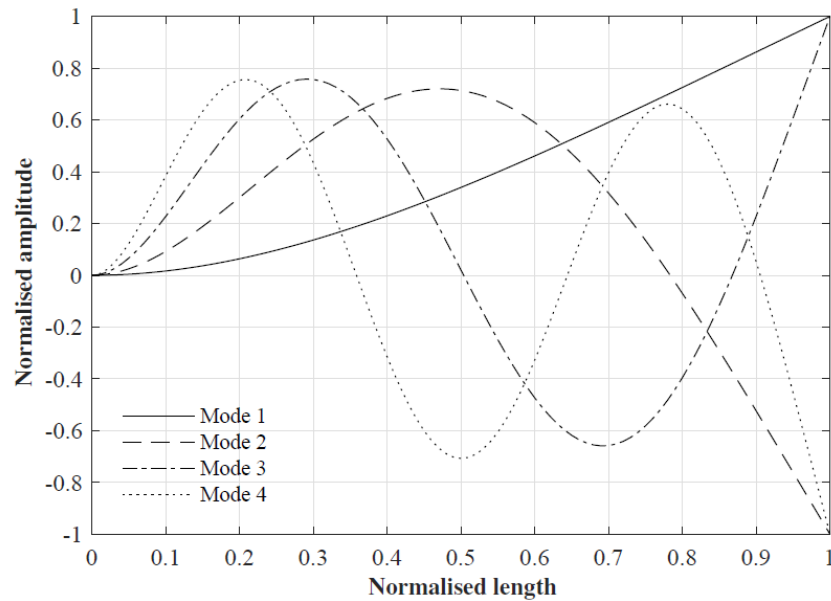
```
%% inset
axes('Position',[.67 0.65 .195 .25]) %0.725
box on
set(gca,'FontName','Times New Roman','FontSize',80)
hold on; %grid on
load('SF-S-H_SWEEP-03.mat')
xlim([4070 4095])
ylim([0 1])
set(gca,'XTick',[4070 4095])
set(gca,'YTick',[0 1])
plot(Data.Frequency(146:664), (Data.Amp(146:664)-20)/60,'LineWidth',1);
set(gca,'FontName','Times New Roman','FontSize',8)
xlabel('Frequency (kHz)','FontName','Times New Roman','FontSize',8,'FontWeight','B');
ylabel('Amplitude (arb.)','FontName','Times New Roman','FontSize',8,'FontWeight','B');
```

Set tick labels and position

Additional annotation (MATLAB generally interprets LATEX notation, can change the interpreter)

```
text(702.5,0.94,'\omega_n \rightarrow','FontName','Times New Roman','FontSize',10,'FontWeight','B')
text(702.1, twodb-0.01,'\Delta\omega_{3dB} \rightarrow','FontName','Times New Roman','FontSize',10,'FontWeight','B')
```

Additional Annotations



Grid on can make reading easier

grid on

Note: You don't always need colour.