```
clear
% ECSE 563 assigmenet 3
% Ali Seifeldin
% https://github.com/Bakalala/MGCILL-ECSE-563
```

```
% Question 1.a

% R = delta f / delta Pe

% 5% decrease in f, 100% increase in active P

f = 60 %Hz
```

```
f = 
60
```

```
Pe1 = 500 % MW
```

```
Pe1 = 
500
```

```
Pe2 = 250 % MW
```

```
Pe2 = 
250
```

```

PeSystem = 2000 % MW
```

```
PeSystem = 
2000
```

```


R1 = f * .05 / Pe1 % Hz/Mw
```

```
R1 = 
0.0060
```

```
R2 = f * .05 / Pe2 % Hz/Mw
```

```
R2 = 
0.0120
```

```

R1Hzpu = R1 * PeSystem % Hz/p.u.
```

```
R1Hzpu = 
12
```

```
R2Hzpu = R2 * PeSystem % Hz/p.u.
```

```
R2Hzpu = 
24
```

```
% To get p.u / p.u, 2000 MW p.u., 60 Hz p.u.

R1pu = R1 * PeSystem / f % p.u./p.u.
```

```
R1pu =
0.2000
```

```
R2pu = R2 * PeSystem / f % p.u./p.u.
```

```
R2pu =
0.4000
```

```
% Question 1.b

% J = (2 Wk0) / w0^2 J/
% M = w0 J / = (2 Wk0) / w0

w0 = 2 * pi * f % rad / s
```

```
w0 =
376.9911
```

```
Wk0 = 21 * 10^9 % GJ
```

```
Wk0 =
2.1000e+10
```

```
Wk0_MWs = Wk0 / 1e6; % MW·s


M = 2 * Wk0_MWs /w0 % MW s^2 /rad.
```

```
M =
111.4085
```

```
Mpu = M / PeSystem % p.u. s^2 / rad
```

```
Mpu =
0.0557
```

```
% Question 1.c

Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```

Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```

R1 = 0.0060 * 2 * pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 * 2 * pi % rad / s MW
```

```
R2 =
0.0754
```

```

M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
```

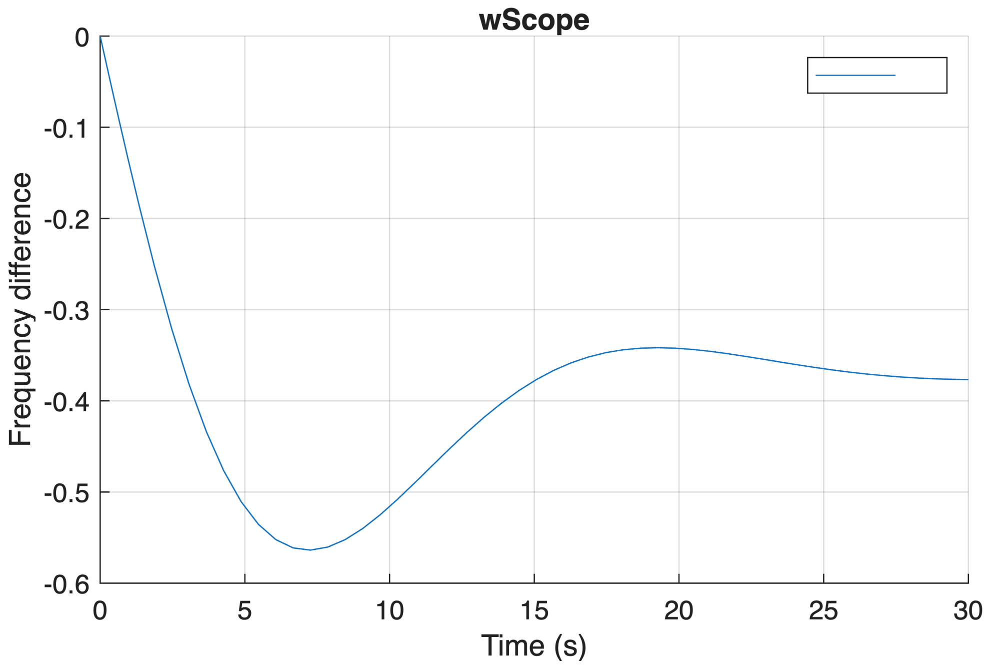
```
M =
111.4100
```

```
D = 20 / ( 2 * pi) % MW s / rad
```

```
D =
3.1831
```

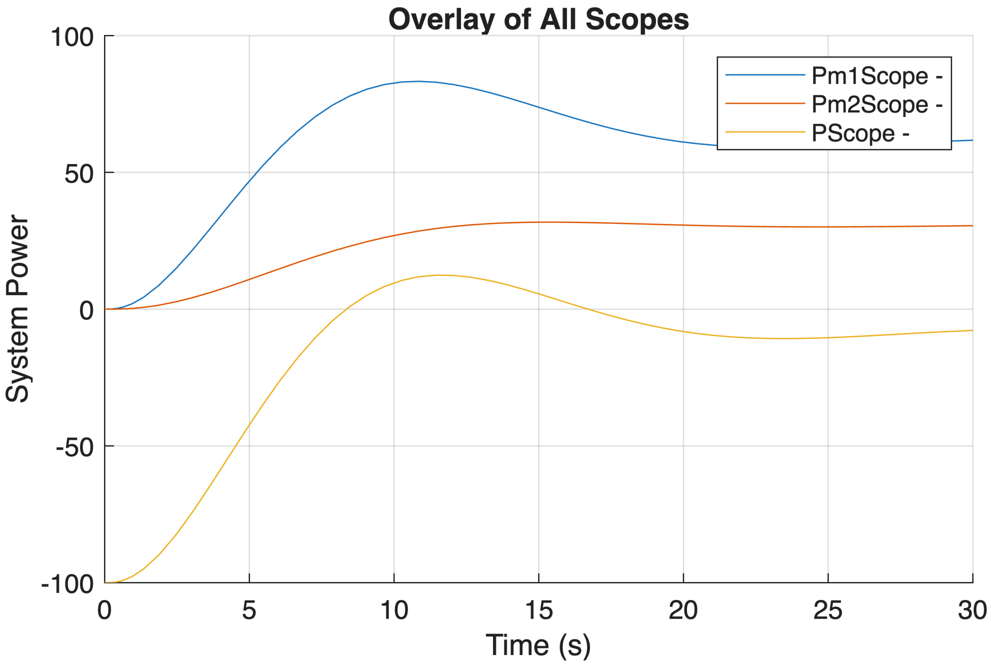
```

% we do the math in MW rads/s

mdl = 'ass3q1c';
load_system(mdl);
set_param(mdl, 'StopTime', '30');

%% Run simulation
out = sim(mdl);
```

```
% Question 1.c

scopeNames = {'wScope'};

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end
    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Frequency difference');
    title(name);
    legend('show');
end
```



```


% we can see that the frequency drops and reaches a nadir of -.55Hz and
% stablises around -.37 Hz
% --> 60 - 0.37Hz so 59.63Hz is the steady state freq
% Simulation is run using rad / s MW
```

```
% Question 1.d

scopeNames = {'Pm1Scope','Pm2Scope','PScope'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};
    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end

xlabel('Time (s)');
ylabel('System Power');
title('Overlay of All Scopes');
legend('show', 'Interpreter', 'none');
```



```
% Pm1 and Pm2 start to ramp up, Pm1 ramps up much faster and does more
'effort' and then eventually
% stablize to a 2/3 and 1/3 split. between both
% we can see on Pscope that with an initial -100 MW, it quikcly shoots up
% to ~+20 MW and stablizes close to the -10 MW.
% the results are consistent with the droop control
```

```
% Question 1.e
```

```
Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```
Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```
R1 = 0.0060 * 2 * pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 * 2 * pi % rad / s MW
```

```
R2 =
0.0754
```

```
M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
```

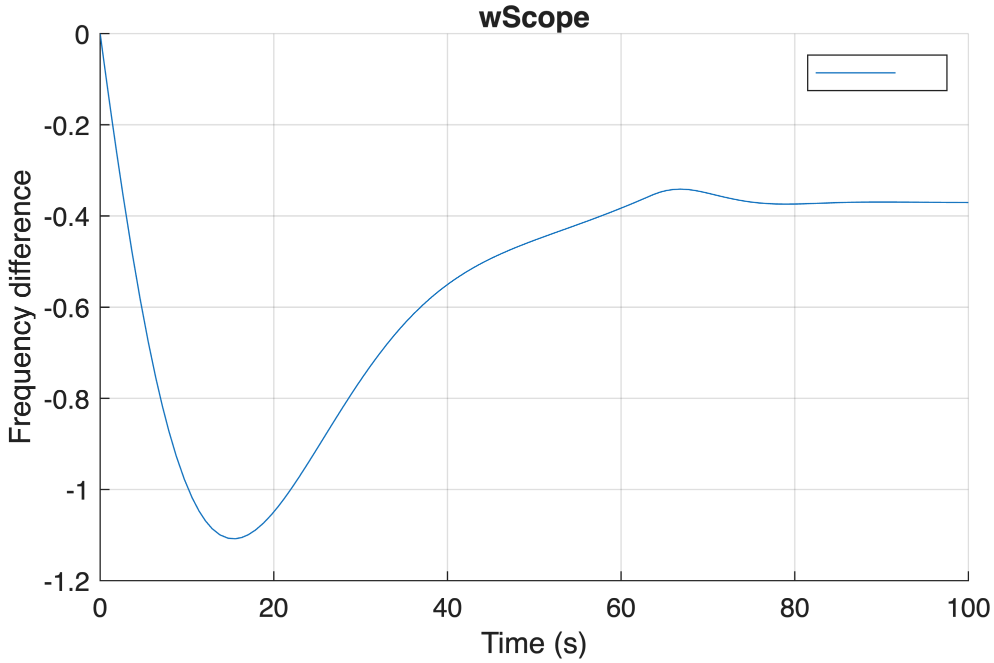
```
M =
111.4100
```

```
D = 20 / ( 2 * pi) % MW s / rad
```

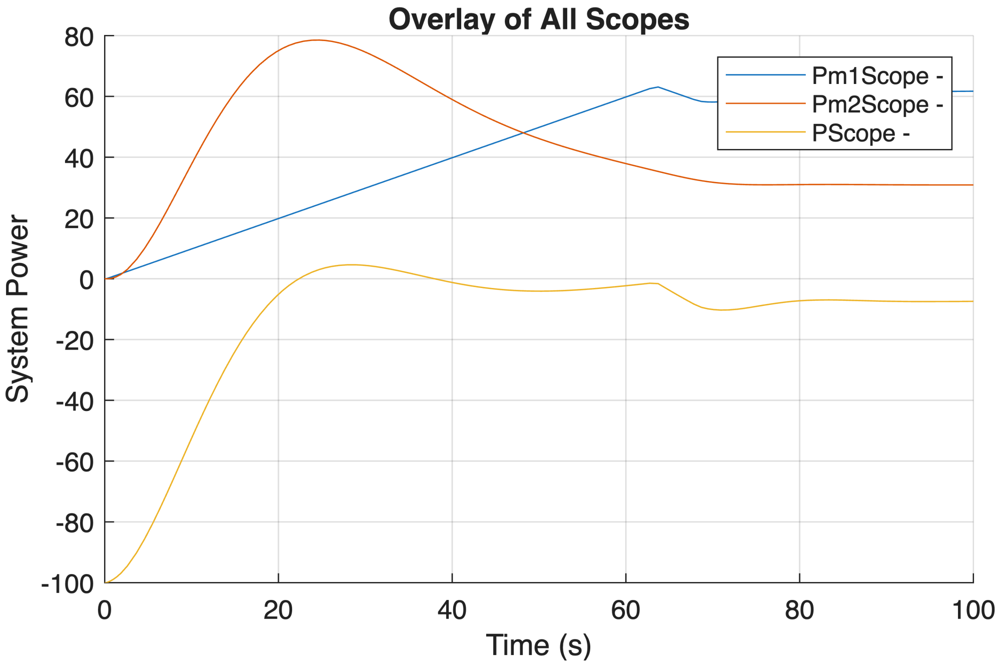
```
D =
3.1831
```

```
% we do the math in MW rads/s

mdl = 'ass3q1e';
load_system(mdl);
set_param(mdl, 'StopTime', '100');

%% Run simulation
out = sim(mdl);

scopeNames = {'wScope'};

for i = 1:numel(scopeNames)
```

```
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Frequency difference');
    title(name);
    legend('show');
end
```



```
scopeNames = {'Pm1Scope','Pm2Scope','PScope'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};
    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end

xlabel('Time (s)');
ylabel('System Power');
title('Overlay of All Scopes');
legend('show', 'Interpreter', 'none');
```



```
% we can observe that setting a slew rate limit of 1 causes
% the frequency to have a nadir of ~-1.1 HZ so 58.9Hz. We also see that
% it takes longer for the freq stabilize.
% P2 does most of th work to compensate for tehe difference initially and
% then it goes down as P1 ramps up. the total power P stabilizes closer to
0 until 60s but then drops
```

```
% Question 2
% tuning K

Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```
Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```
R1 = 0.0060 * 2 * pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 * 2 * pi % rad / s MW
```

```
R2 =
0.0754
```

```
M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
```

```
M =
111.4100
```

```
D = 20 / ( 2 * pi) % MW s / rad
```

```
D =
3.1831
```

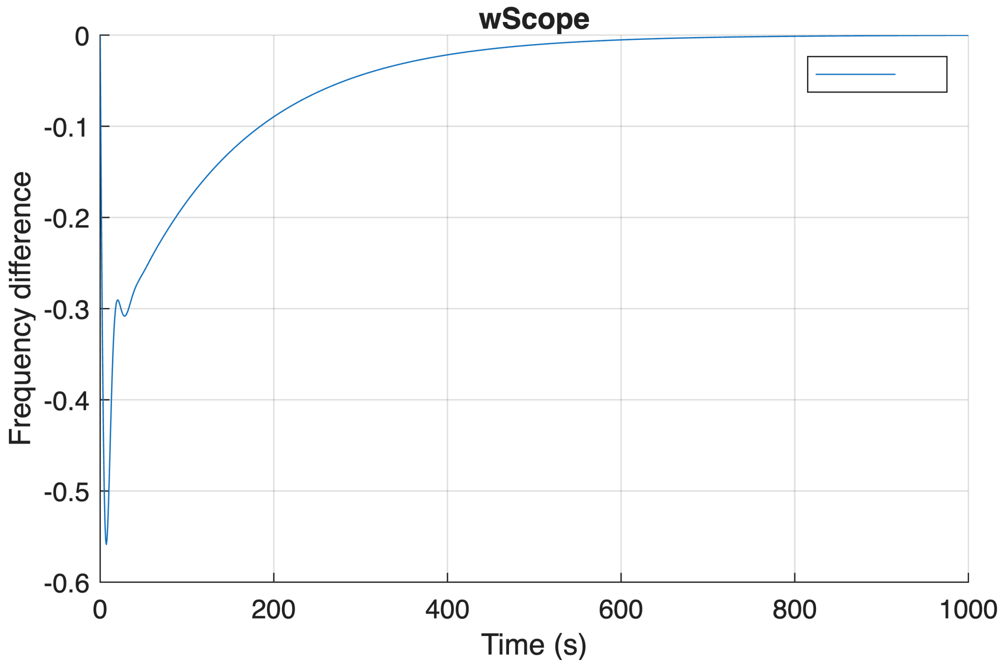
```
K = 0.3
```

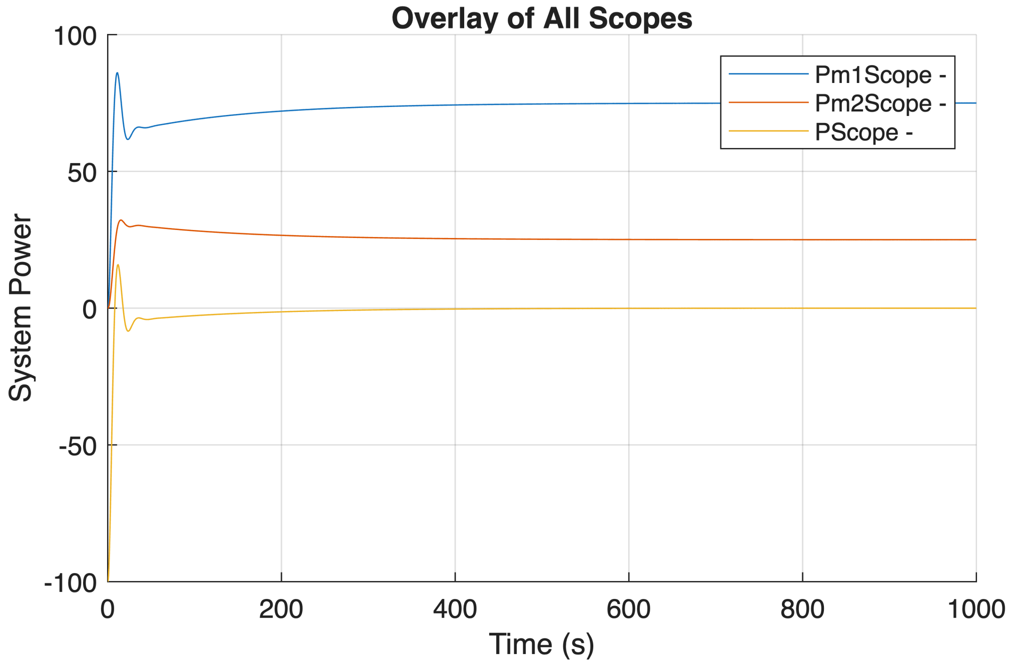
```
K =
0.3000
```

```
% we do the math in MW rads/s

for i = 1:10

    mdl = 'ass3q2';
    load_system(mdl);
```

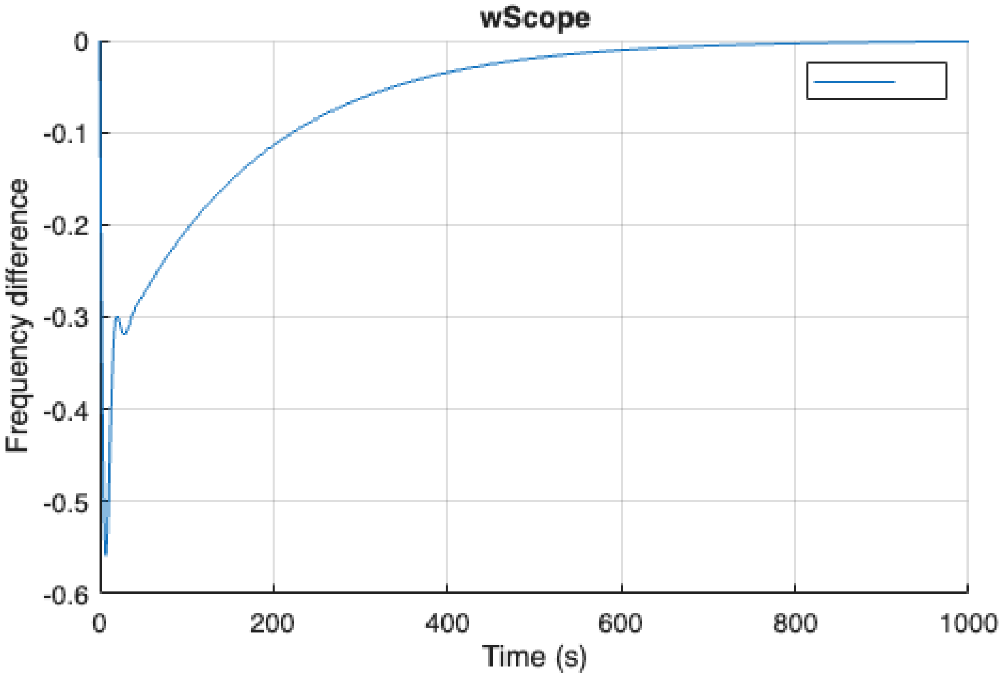
```
set_param(mdl, 'StopTime', '1000');

%% Run simulation
out = sim(mdl);

scopeNames = {'wScope'};

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Frequency difference');
    title(name);
    legend('show');
end

scopeNames = {'Pm1Scope','Pm2Scope','PScope'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
```

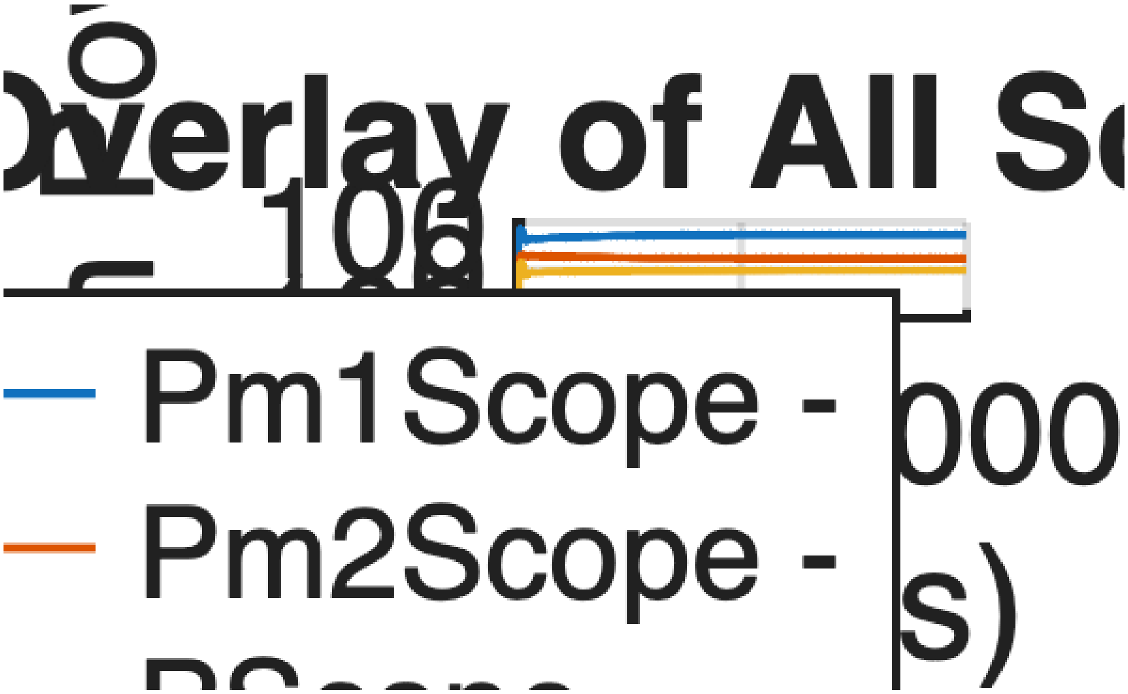
```
            plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - ' sig.Name]);
        end
    end

    xlabel('Time (s)');
    ylabel('System Power');
    title('Overlay of All Scopes');
    legend('show', 'Interpreter', 'none');

    K = K - .05
end
```



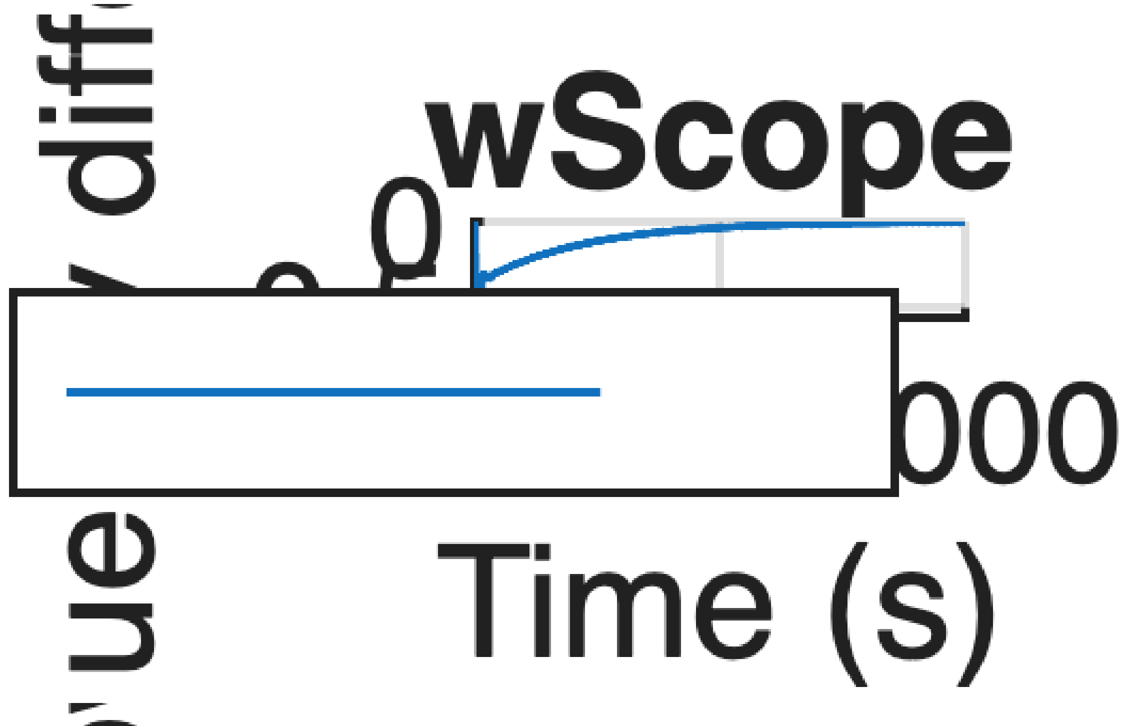


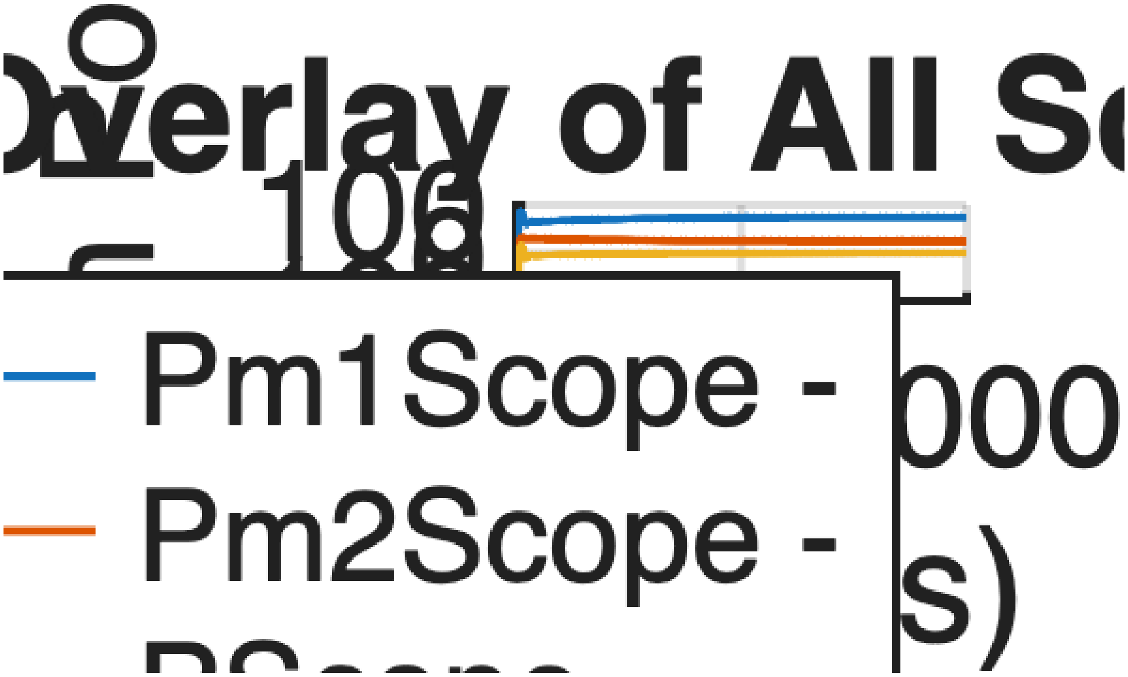
```
K =
0.2500
```



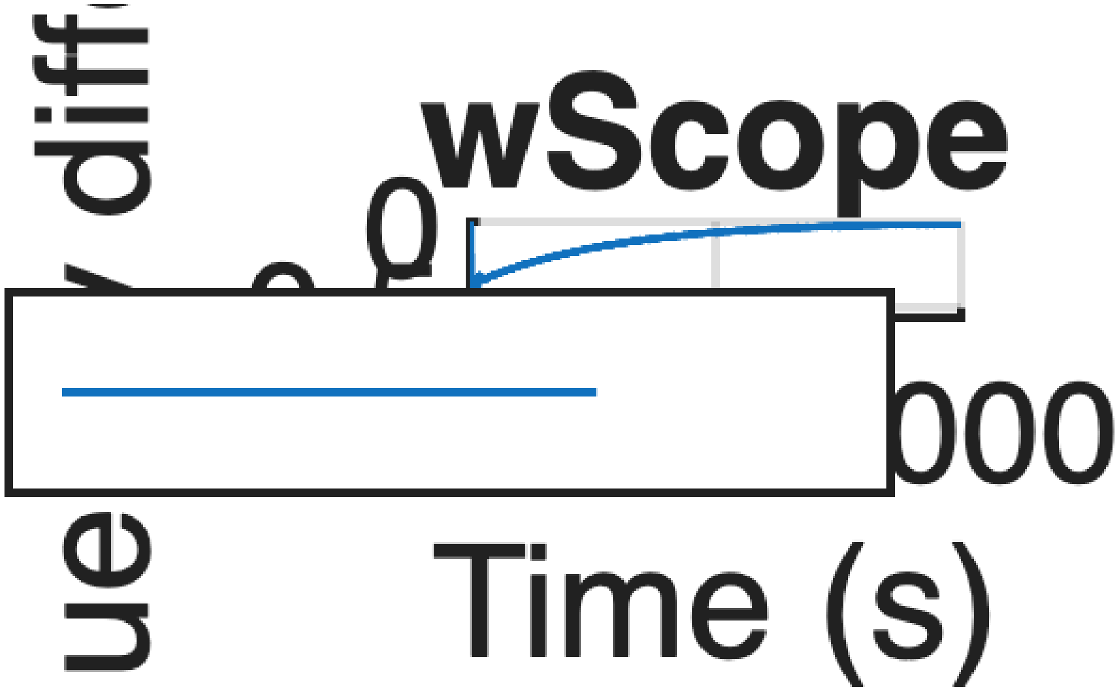


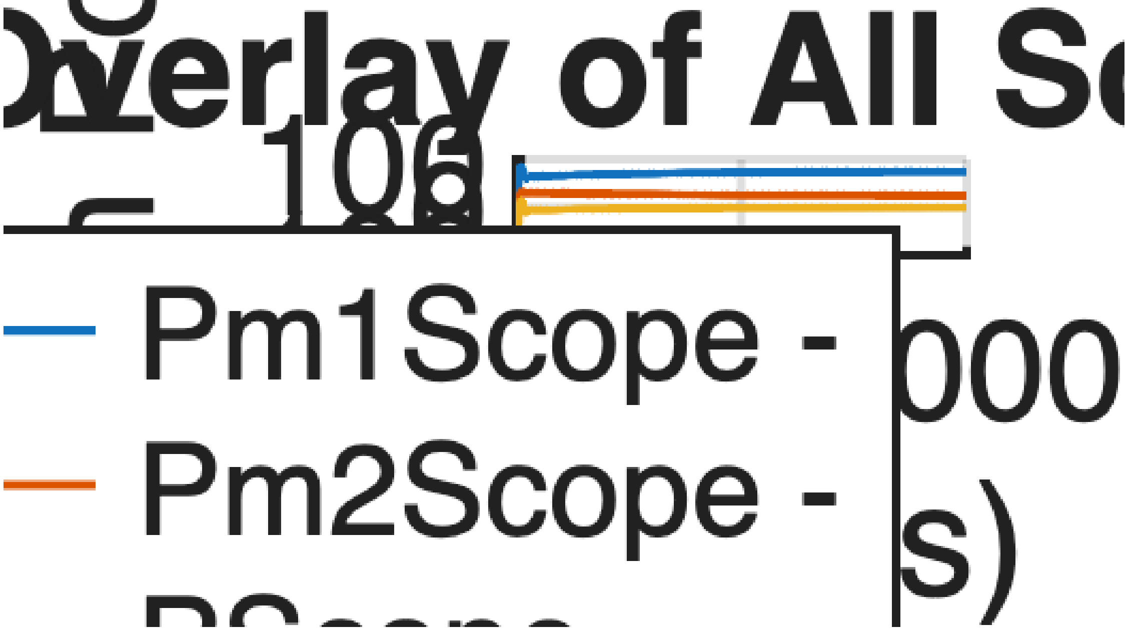
```
K =
0.2000
```


wScope
0
000
Time (s)
orque diff

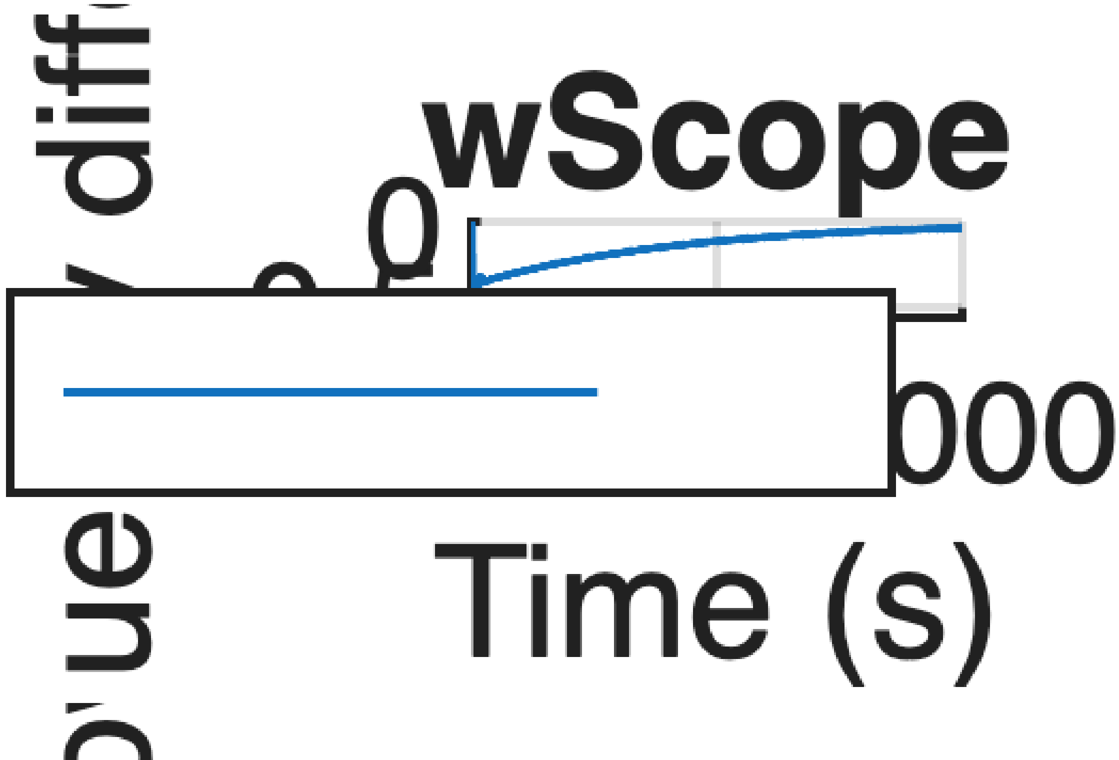

Overlay of All Sc
106
Pm1Scope -
Pm2Scope -
000
s)

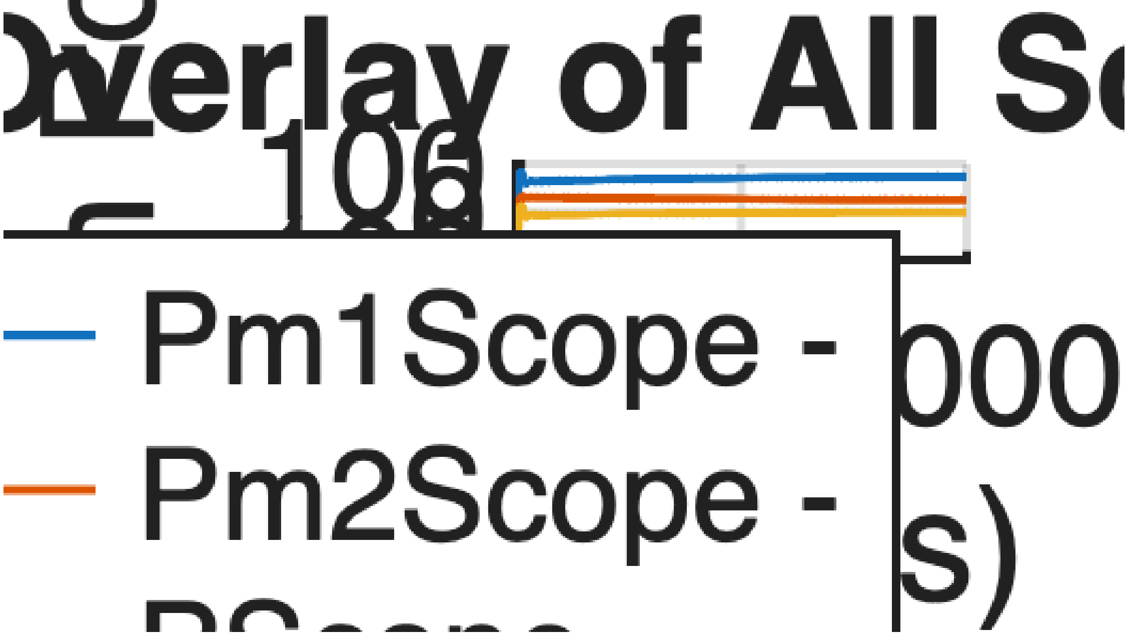
```
K =
0.1500
```


wScope
0
000
Time (s)

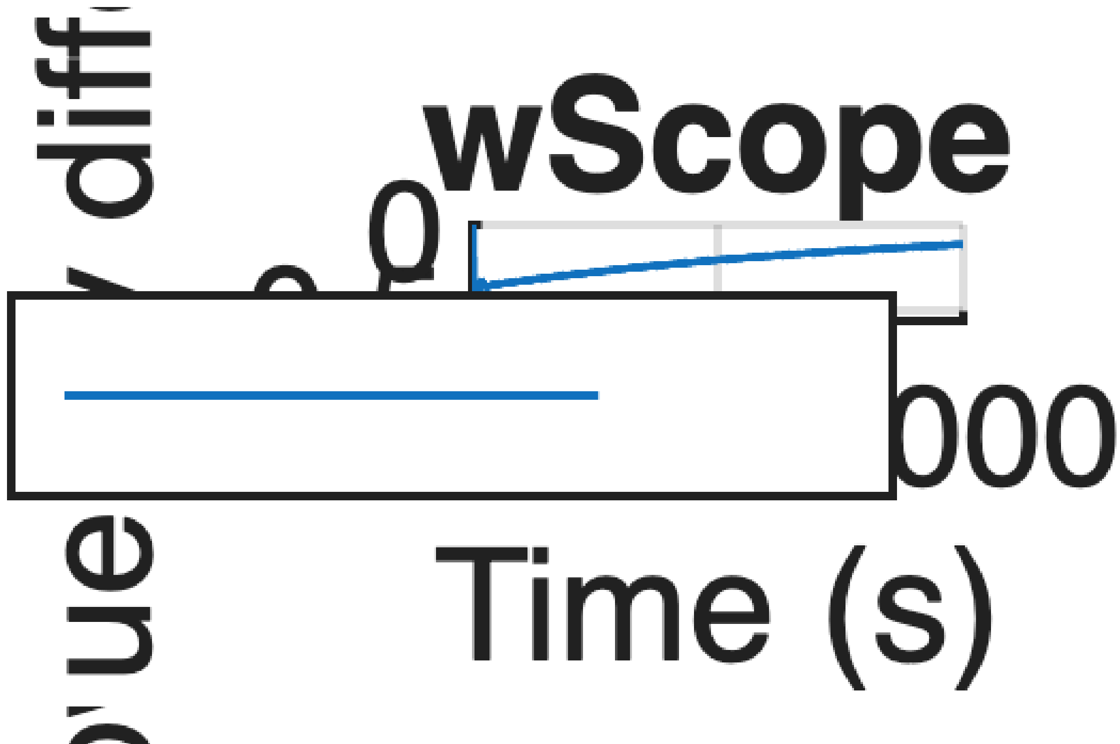

Overlay of All Sc
106
000
s)
Pm1Scope -
Pm2Scope -

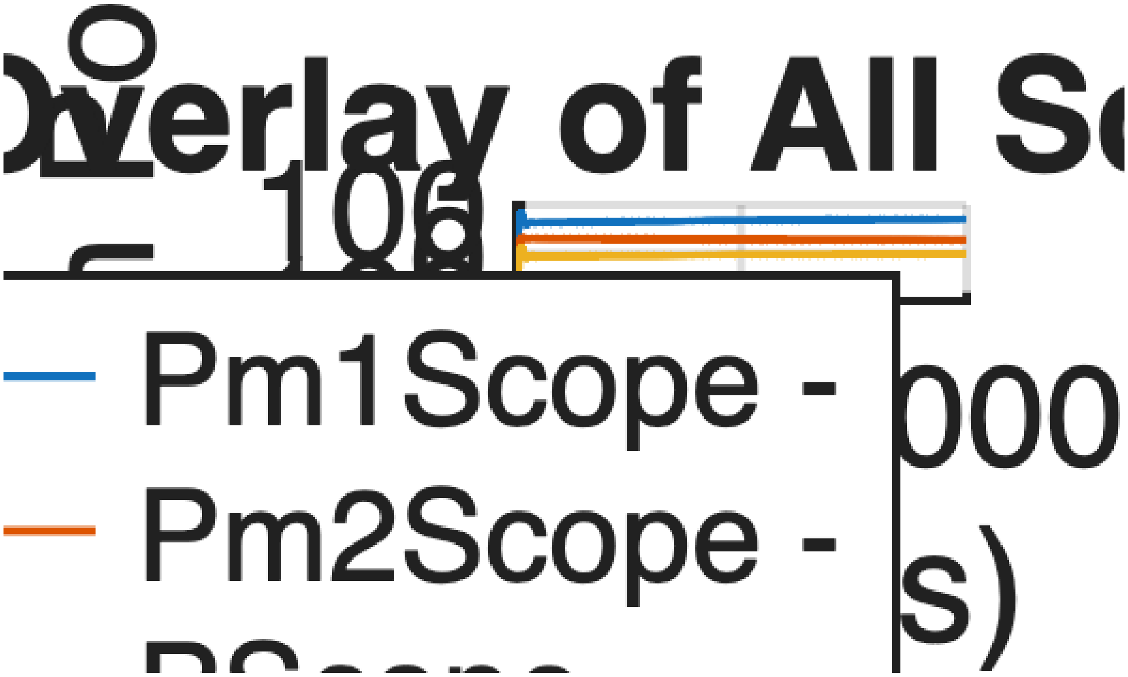
```
K =
0.1000
```


wScope
0
000
Time (s)

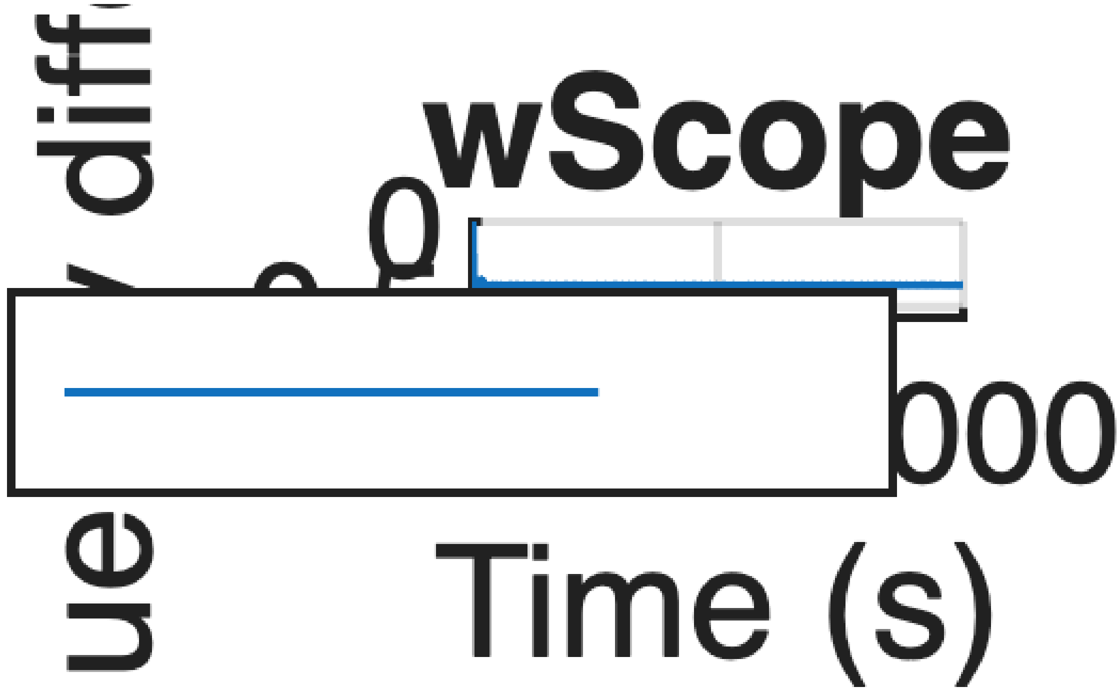

Overlay of All Sc
106
Pm1Scope -
Pm2Scope -
000
s)

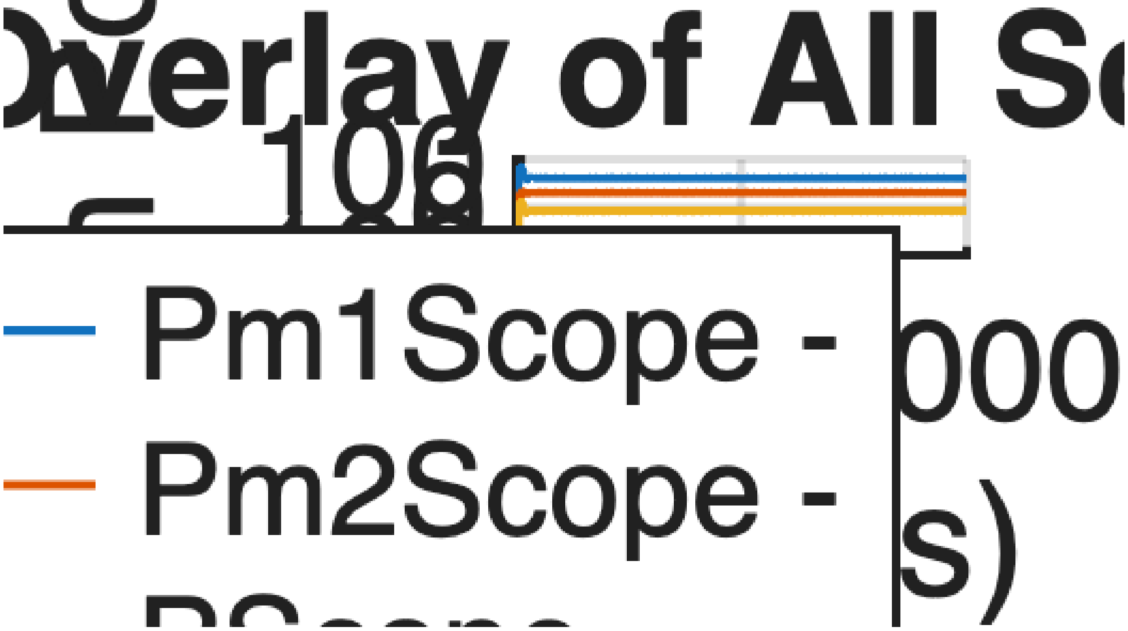
```
K =
0.0500
```


wScope
0
000
Time (s)
Torque diff

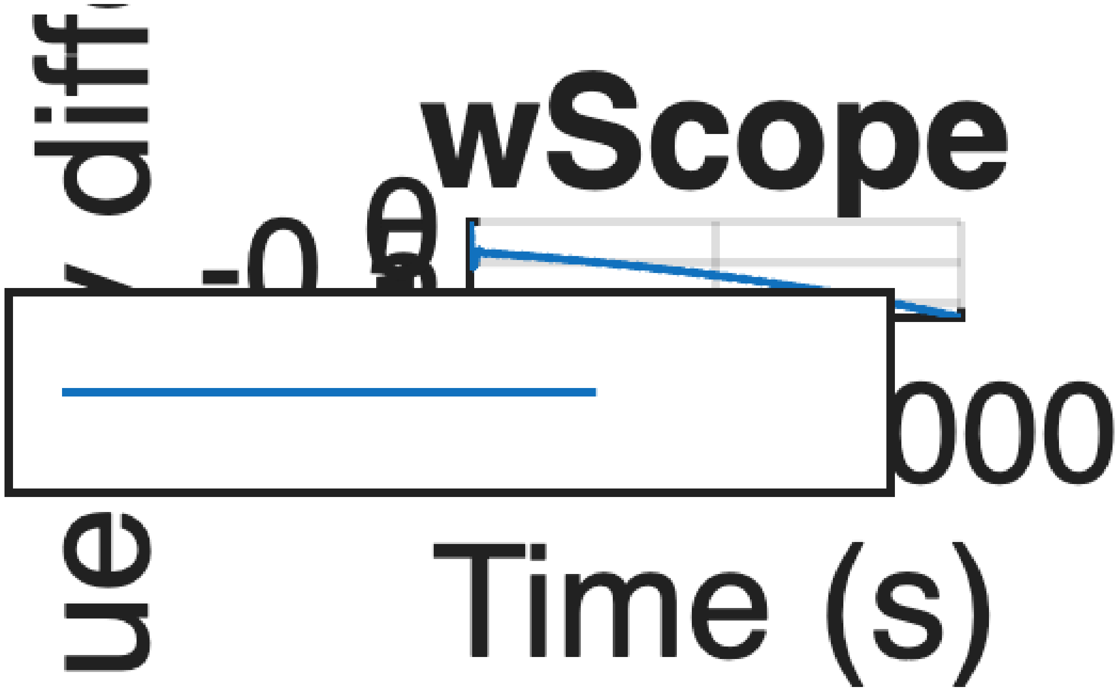

Overlay of All Sc
106
000
s)
Pm1Scope -
Pm2Scope -
PScope

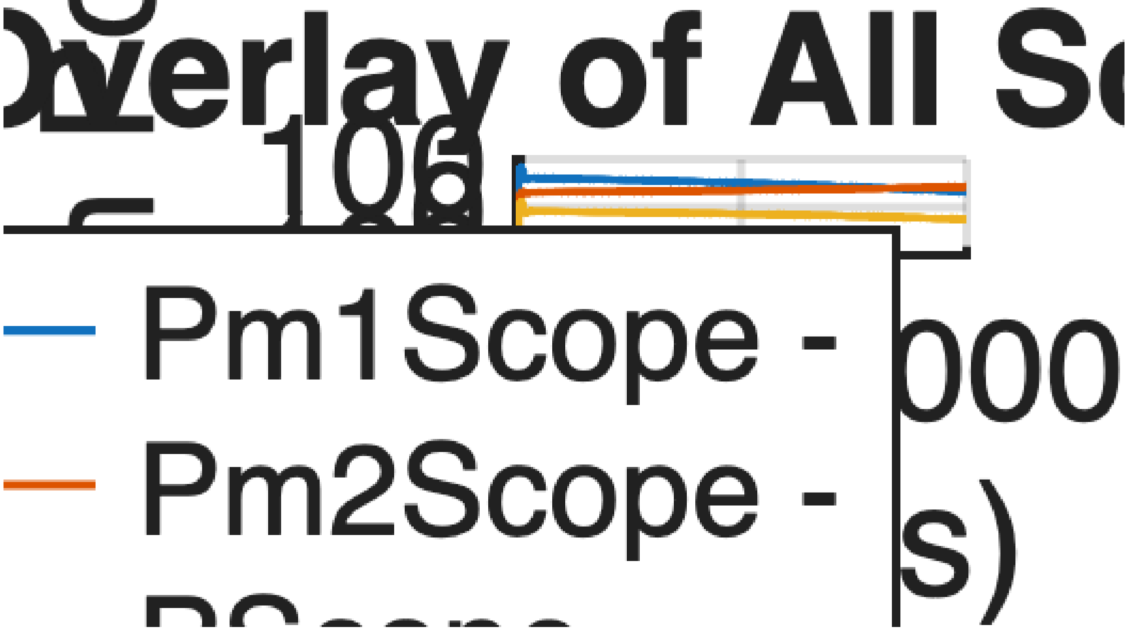
```
K =
1.3878e-17
```


wScope
0
000
Time (s)
y diff
orque

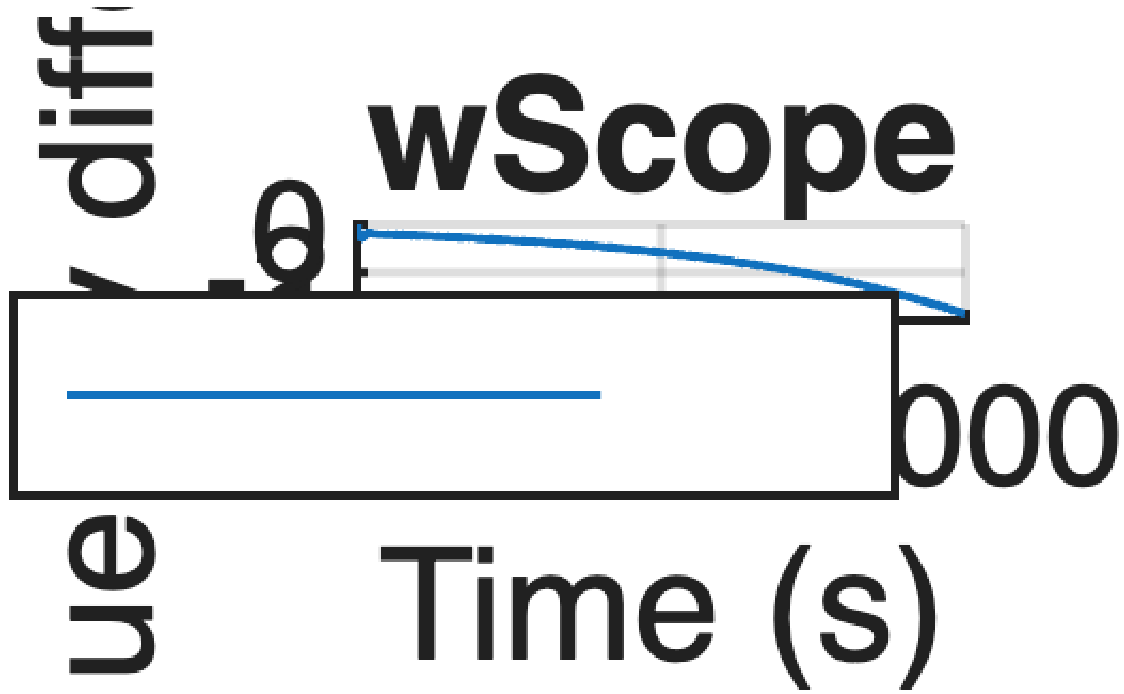

Overlay of All Sc
106
Pm1Scope -
Pm2Scope -
PScope
000
s)

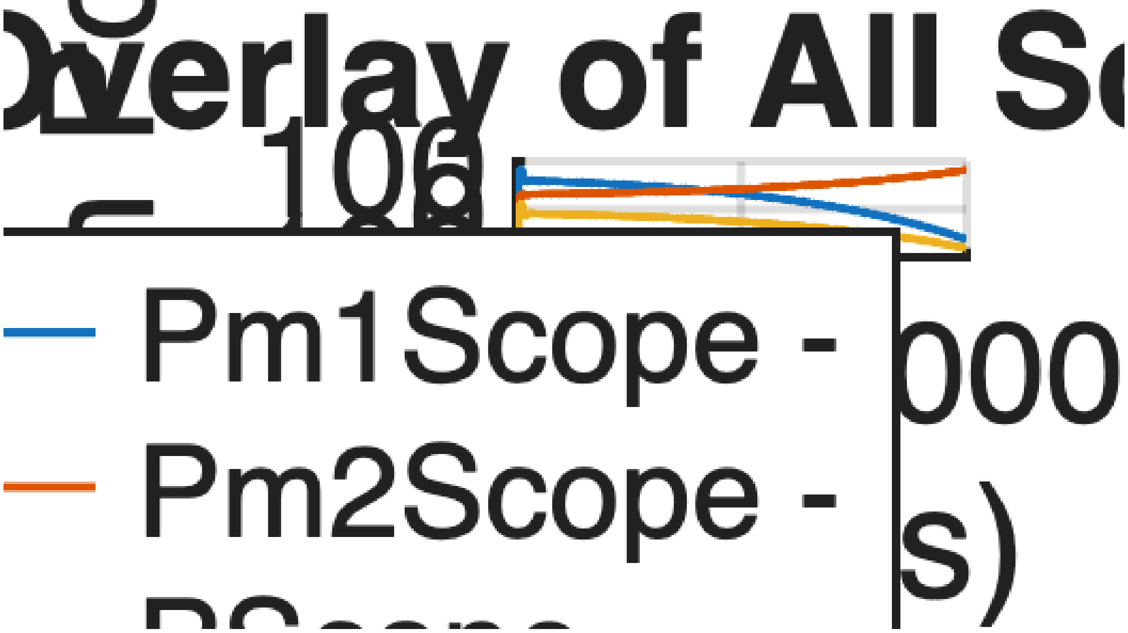
```
K =
-0.0500
```


wScope
-0.8
000
Time (s)

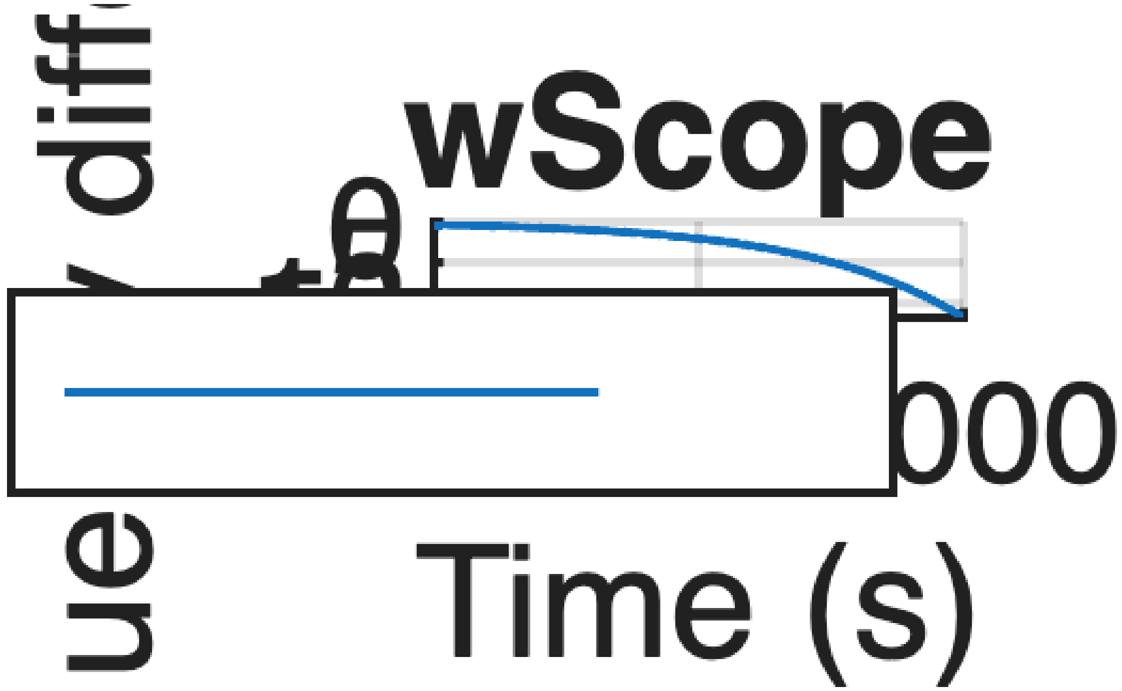

Overlay of All Sc
106
Pm1Scope -
Pm2Scope -
PScope
000
s)

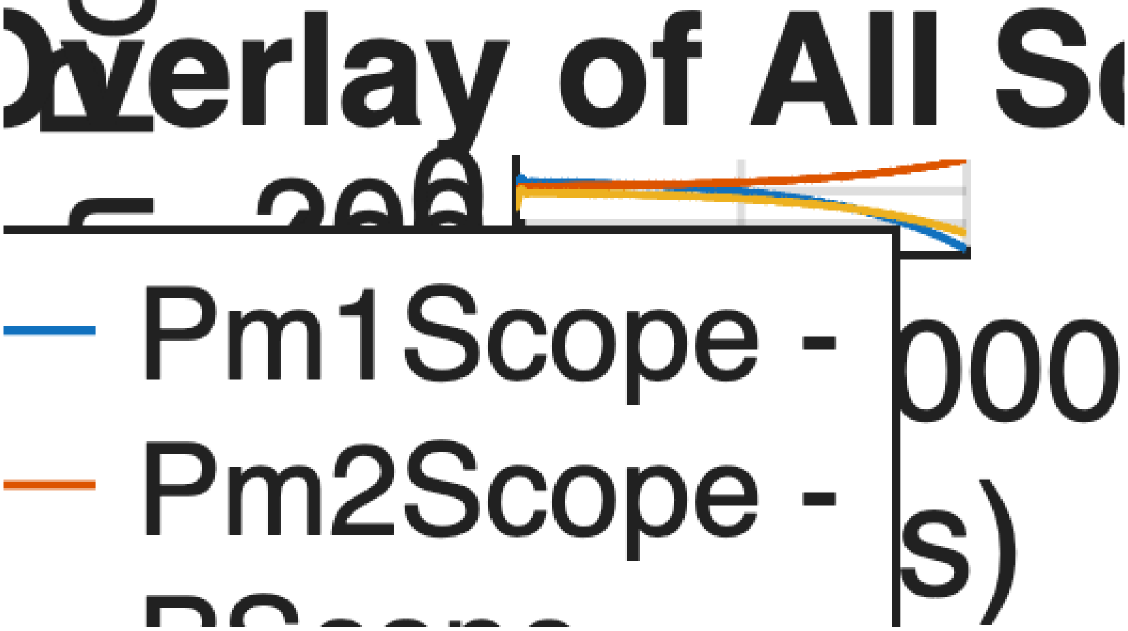
```
K =
-0.1000
```


wScope
0
000
Time (s)


Overlay of All Sc
106
000
s)
Pm1Scope -
Pm2Scope -

```
K =
-0.1500
```





```
K =
-0.2000
```

```
% Question 2
% after selecting K

Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```

Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```

R1 = 0.0060 * 2 * pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 * 2 * pi % rad / s MW
```

```
R2 =
0.0754
```

```

M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
```

```
M =
111.4100
```

```
D = 20 / ( 2 * pi) % MW s / rad
```

```
D =
3.1831
```

```

K = .25 %MW
```

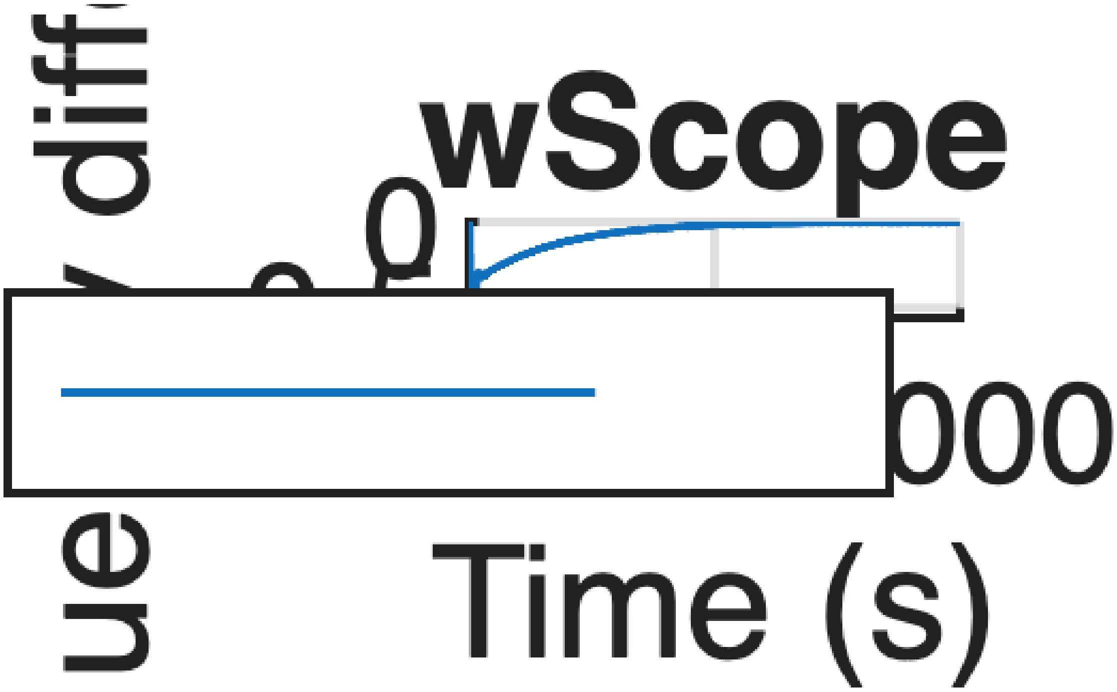
```
K =
0.2500
```

```

% we do the math in MW rads/s


mdl = 'ass3q2';
load_system(mdl);
min15 = 60*15
```

```
min15 =
900
```

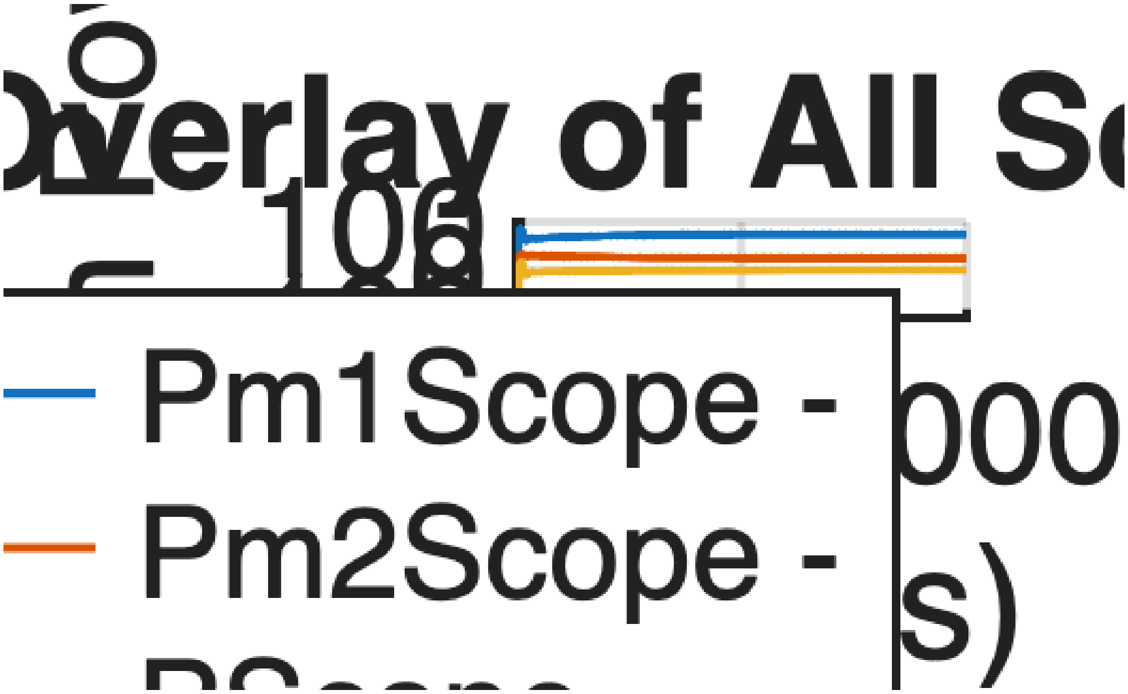
```
set_param(mdl, 'StopTime', '1000');
```

```
%% Run simulation
out = sim(mdl);

scopeNames = {'wScope'};

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Frequency difference');
    title(name);
    legend('show');
end
```



```
scopeNames = {'Pm1Scope','Pm2Scope','PScope'};
```

```
figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end

xlabel('Time (s)');
ylabel('System Power');
title('Overlay of All Scopes');
legend('show', 'Interpreter', 'none');
```



```
% Playing around with K, we can stick K = .25 we have one small osciliation
initially
% and then it slowly ramps back to 60 Hz at around 850 seconds
% there is also minimal ocsilation in the steady state
```

```
% Question 3

Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```

Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```

R1 = 0.0060 * 2 * pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 * 2 * pi % rad / s MW
```

```
R2 =
0.0754
```

```

Mred = 1.1141e+08 / 10^6 * .6 % convert to MW s^2 / rad
```

```
Mred =
66.8460
```

```
Dred = 20 / ( 2 * pi) * .5 % MW s / rad
```

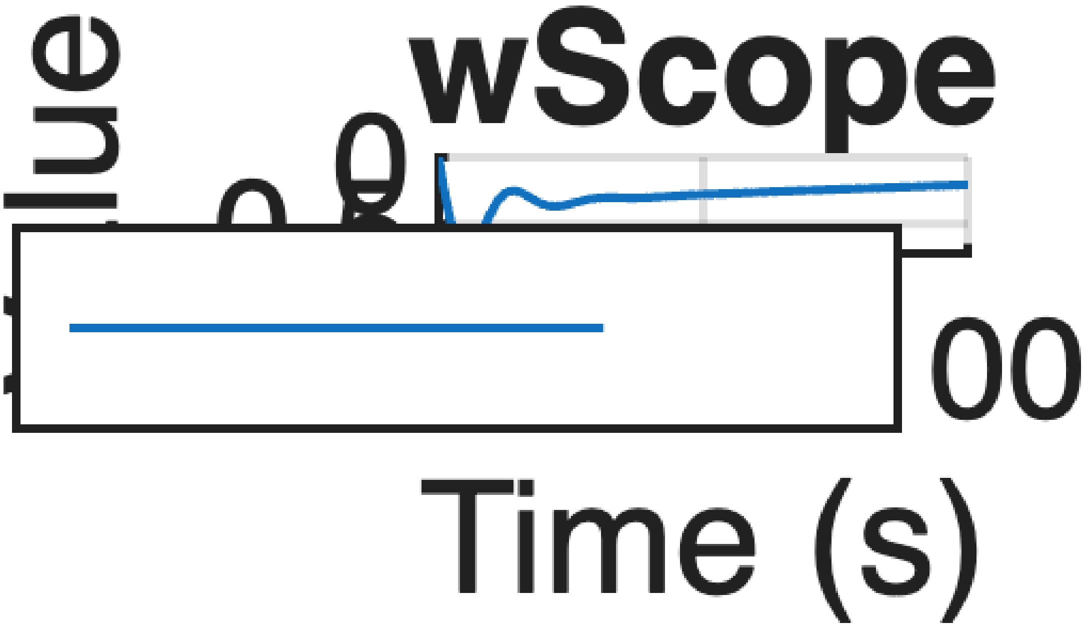
```
Dred =
1.5915
```

```

K = 0.25 %MW
```

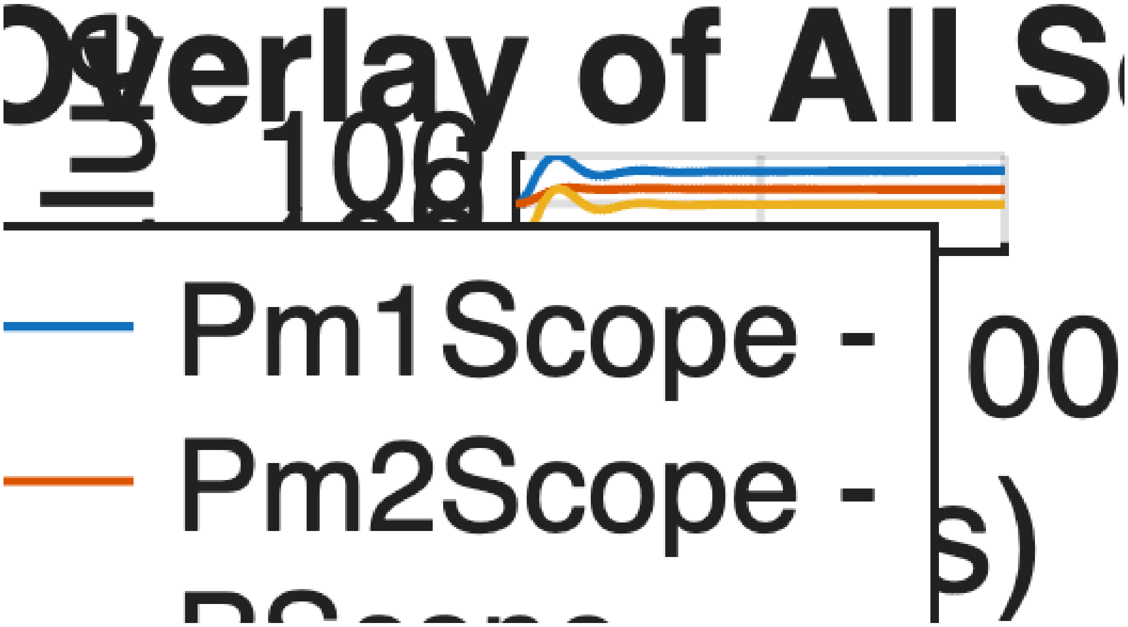
```
K =
0.2500
```

```

% we do the math in MW rads/s
```

```
mdl = 'ass3q3';
load_system(mdl);
set_param(mdl, 'StopTime', '100');

%% Run simulation
out = sim(mdl);

scopeNames = {'wScope'};

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Value');
    title(name);
    legend('show');
end
```



```
scopeNames = {'Pm1Scope','Pm2Scope','PScope'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end

xlabel('Time (s)');
ylabel('Value');
title('Overlay of All Scopes');
legend('show', 'Interpreter', 'none');
```



```
% For the frequency, we get a lower Nadir as well as more oscillations.
% the same can be said about power, as Ptotal goes to 25Mw in less than 5
% seconds, then goes to -10 MW and then goes bck above around 25 seconds
% then back below.
% reducing M and D make the drops faster and have more oscilation for the
% same K we selected.
```

```
% Question 4 no control

Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```
Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```
R1 = 0.0060 * 2 * pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 * 2 * pi % rad / s MW
```

```
R2 =
0.0754
```

```


M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
```

```
M =
111.4100
```

```
D = 20 / ( 2 * pi) % MW s / rad
```

```
D =
3.1831
```

```

B = 1/R1 + 1/R2 + D % Mw
```

```
B =
42.9718
```

```

K = .25
```

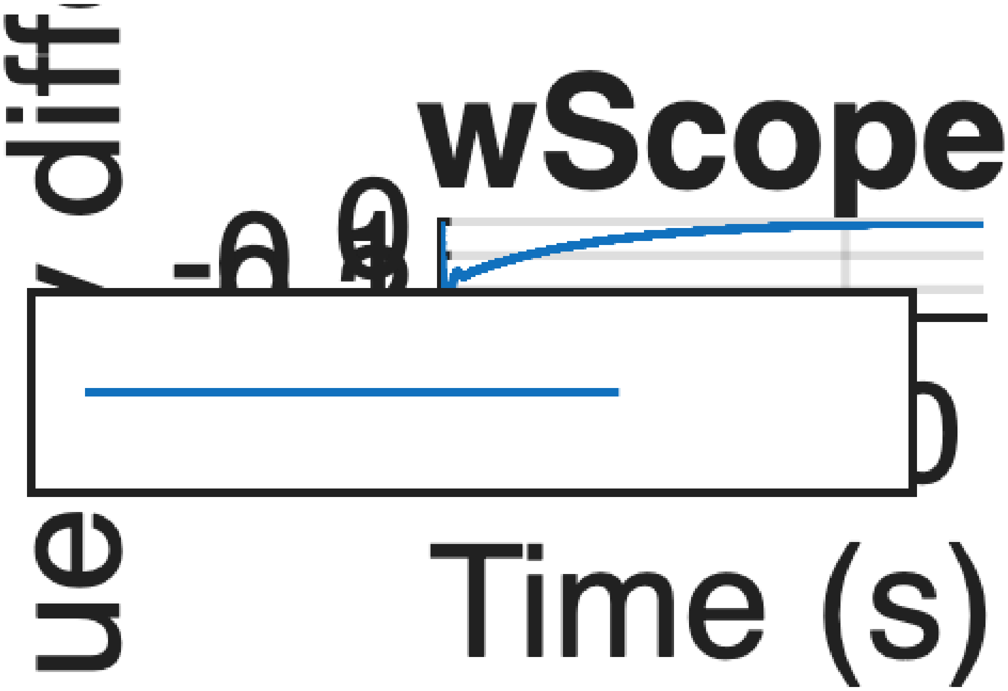
```
K =
0.2500
```

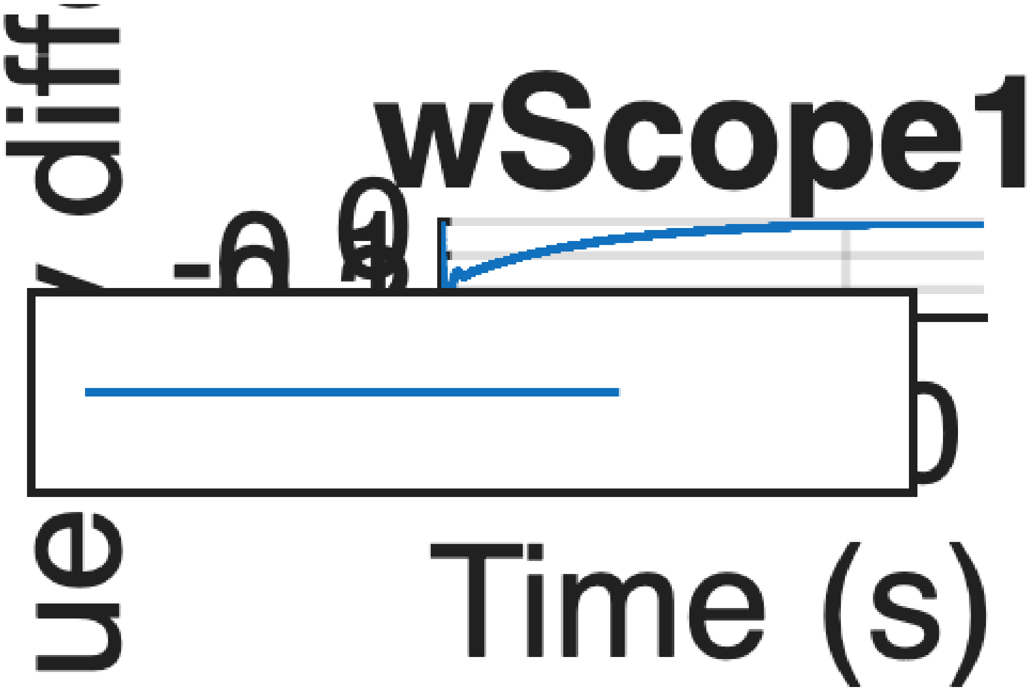
```
T = 20000
```

```
T =
20000
```

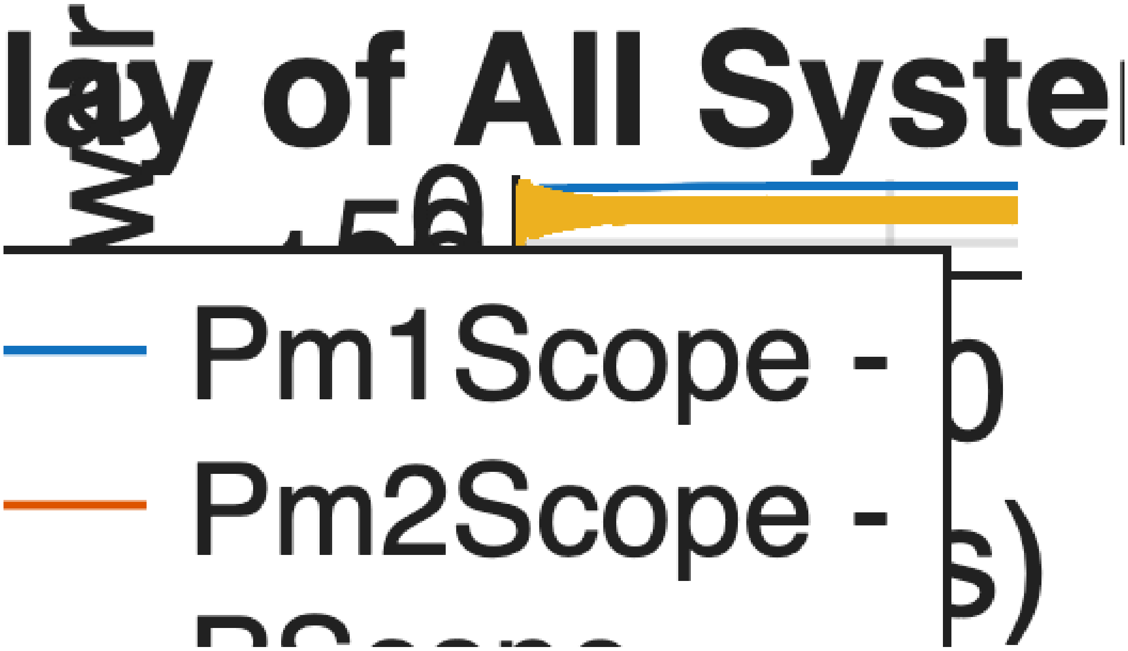
```
% we do the math in MW rads/s


mdl = 'ass3q4';
load_system(mdl);
set_param(mdl, 'StopTime', '1200');

%% Run simulation
out = sim(mdl);

scopeNames = {'wScope', 'wScope1'};

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
```

```
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Frequency difference');
    title(name);
    legend('show');
end
```

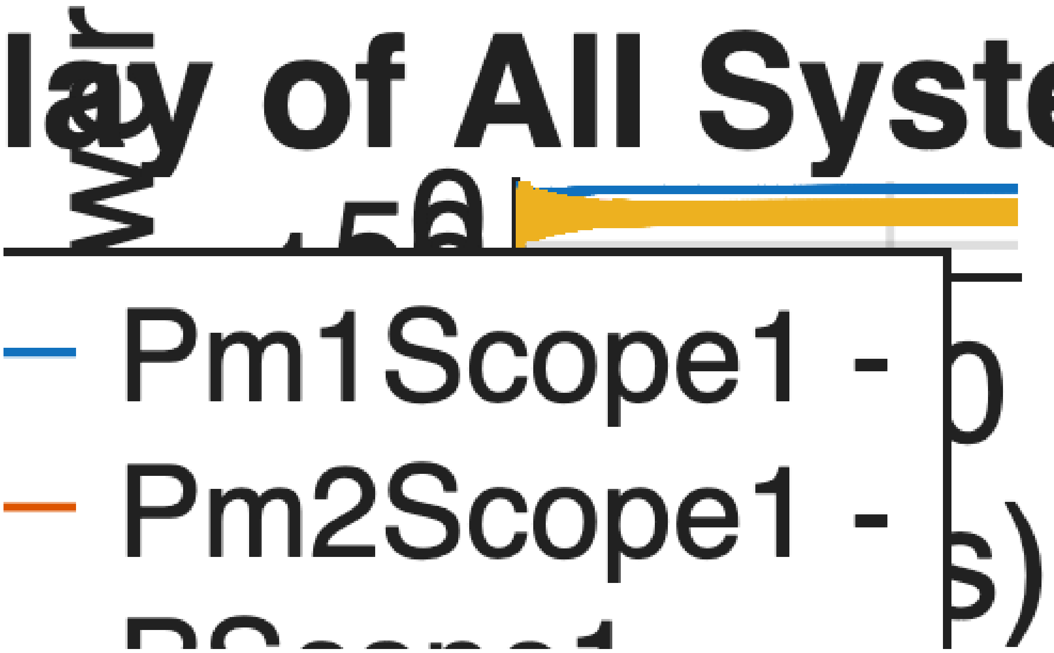




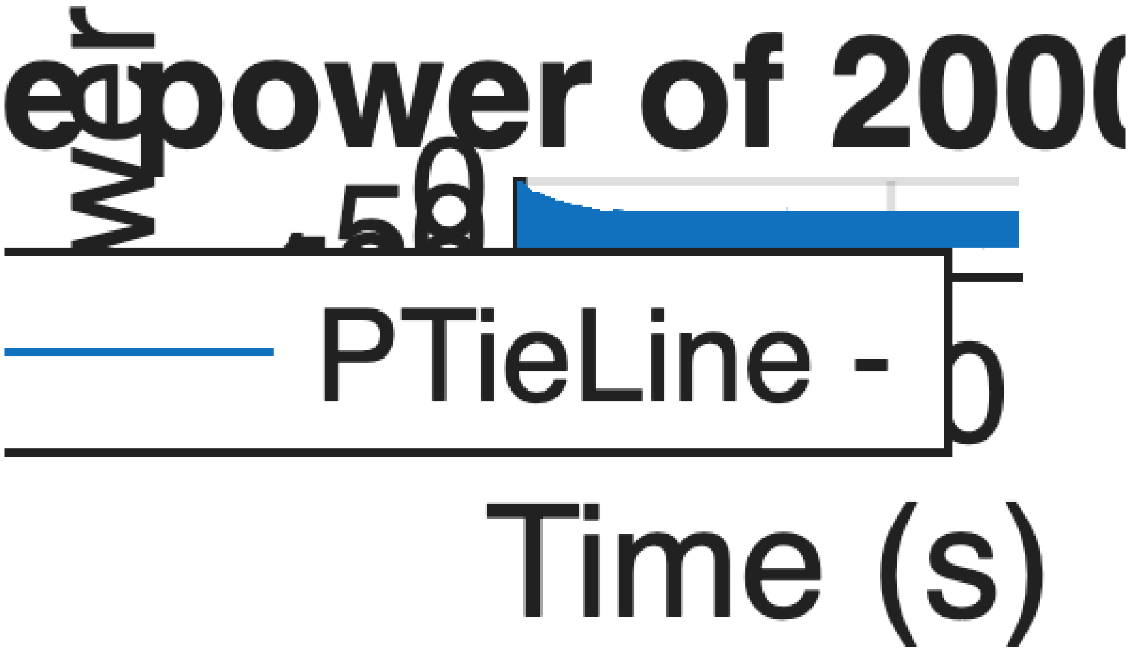
```
scopeNames = {'Pm1Scope','Pm2Scope','PScope'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end

xlabel('Time (s)');
ylabel('Power');
title('Overlay of All System 1 Power');
legend('show', 'Interpreter', 'none');
```



```
scopeNames = {'Pm1Scope1','Pm2Scope1','PScope1'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end


xlabel('Time (s)');
ylabel('Power');
title('Overlay of All System 2 Power');
legend('show', 'Interpreter', 'none');
```



```
scopeNames = {'PTieLine'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end


xlabel('Time (s)');
ylabel('Power');
title('Tie Line power of 2000MW system');
legend('show', 'Interpreter', 'none');
```



```
% We can see that the frequencygoes back to 0, but the tie line power
% ocsillated around −50 MW.
```

```
% Question 4 with control
Tch1 = 3 %s
```

```
Tch1 =
3
```

```
Tch2 = 8 %s
```

```
Tch2 =
8
```

```
Tg1 = 0.25
```

```
Tg1 =
0.2500
```

```
Tg2 = 0.50
```

```
Tg2 =
0.5000
```

```
R1 = 0.0060 ∗ 2 ∗ pi % rad / s MW
```

```
R1 =
0.0377
```

```
R2 = 0.0120 ∗ 2 ∗ pi % rad / s MW
```

```
R2 =
0.0754
```

```
M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
```

```
M =
111.4100
```

```
D = 20 / ( 2 * pi) % MW s / rad
```

```
D =
3.1831
```

```
B = 1/R1 + 1/R2 + D % Mw
```

```
B =
42.9718
```

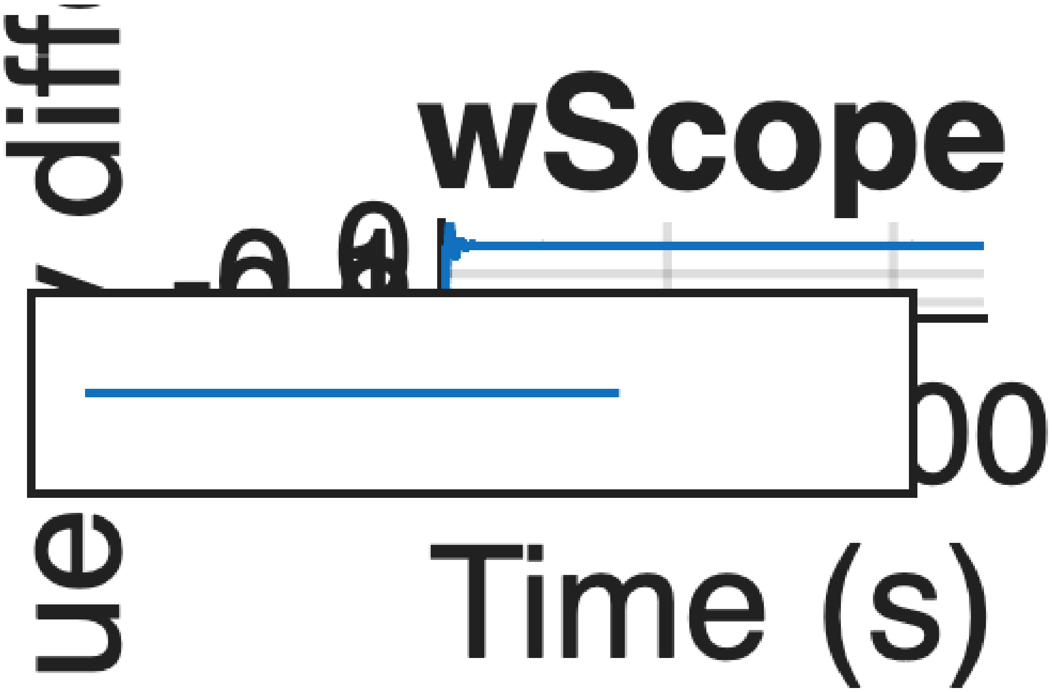
```
K = .1
```

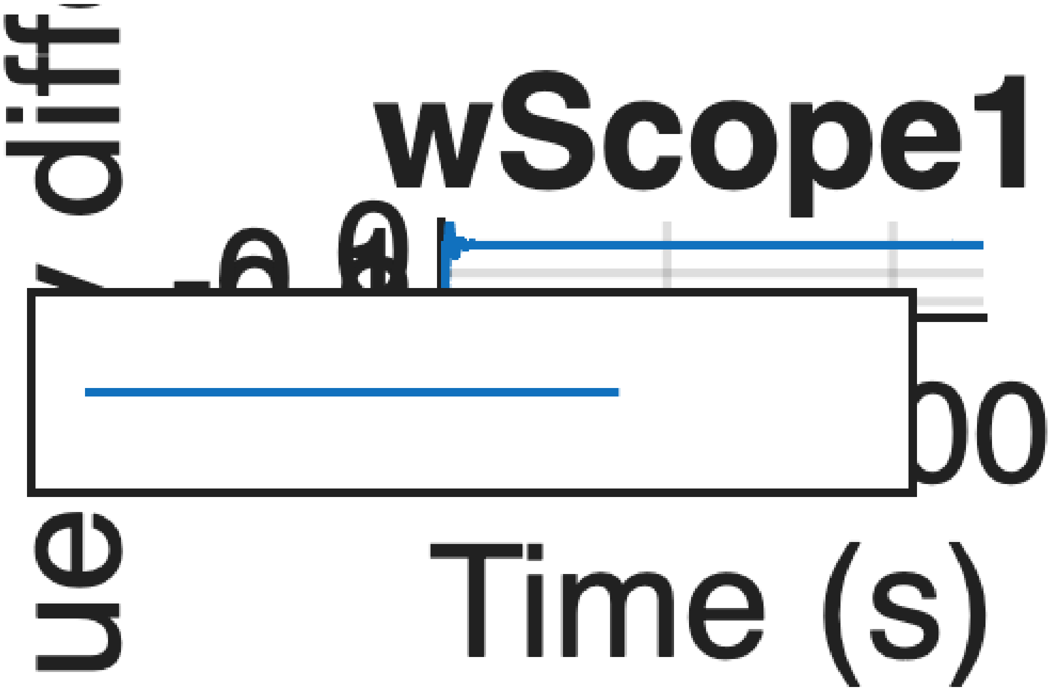
```
K =
0.1000
```

```
T = 20000
```

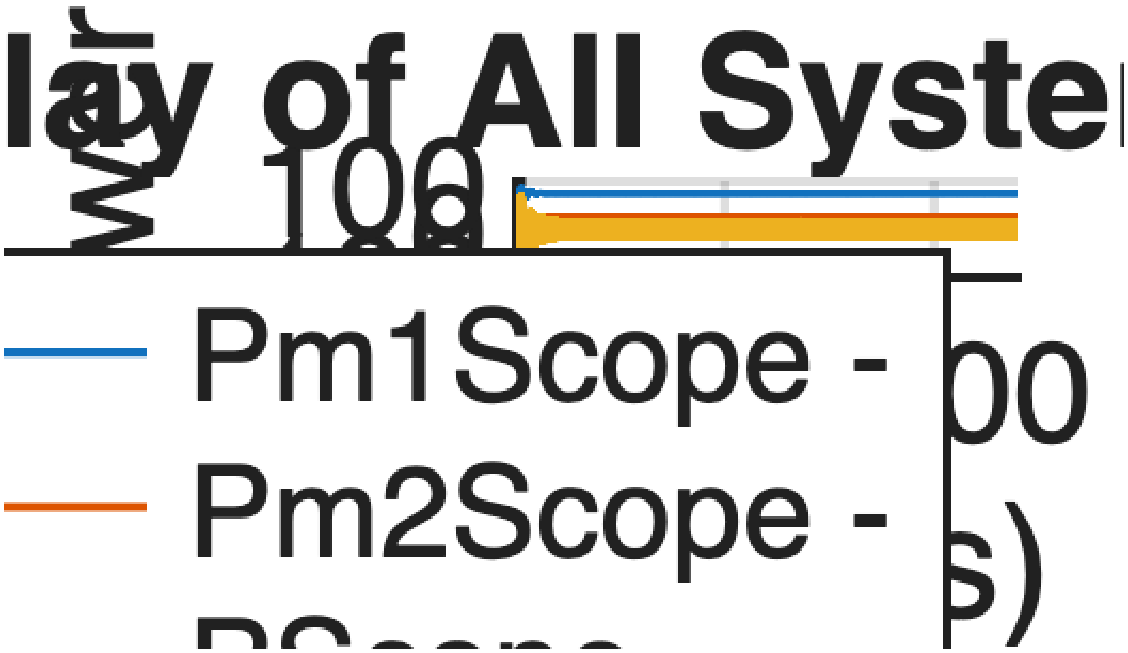
```
T =
20000
```

```
% we do the math in MW rads/s


mdl = 'ass3q4Control';
load_system(mdl);
set_param(mdl, 'StopTime', '1200');

%% Run simulation
out = sim(mdl);

scopeNames = {'wScope', 'wScope1'};

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end
    % Plot all signals in this dataset
    figure('Name', name, 'NumberTitle', 'off');
    hold on; grid on;
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', sig.Name);
    end
    xlabel('Time (s)');
    ylabel('Frequency difference');
    title(name);
    legend('show');
end
```

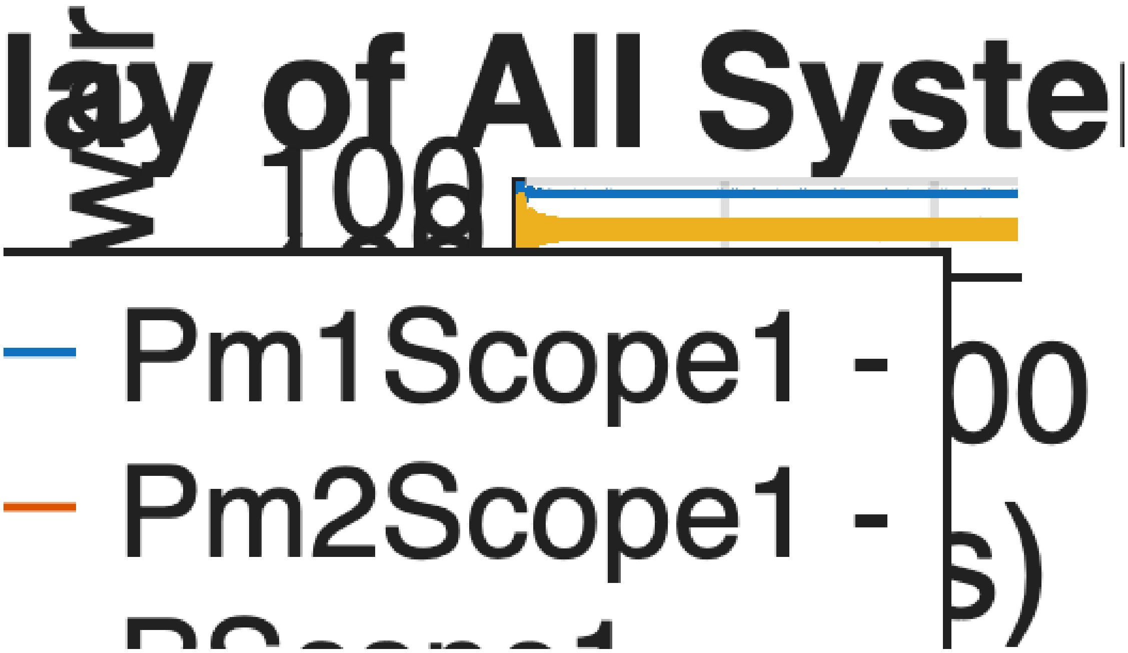




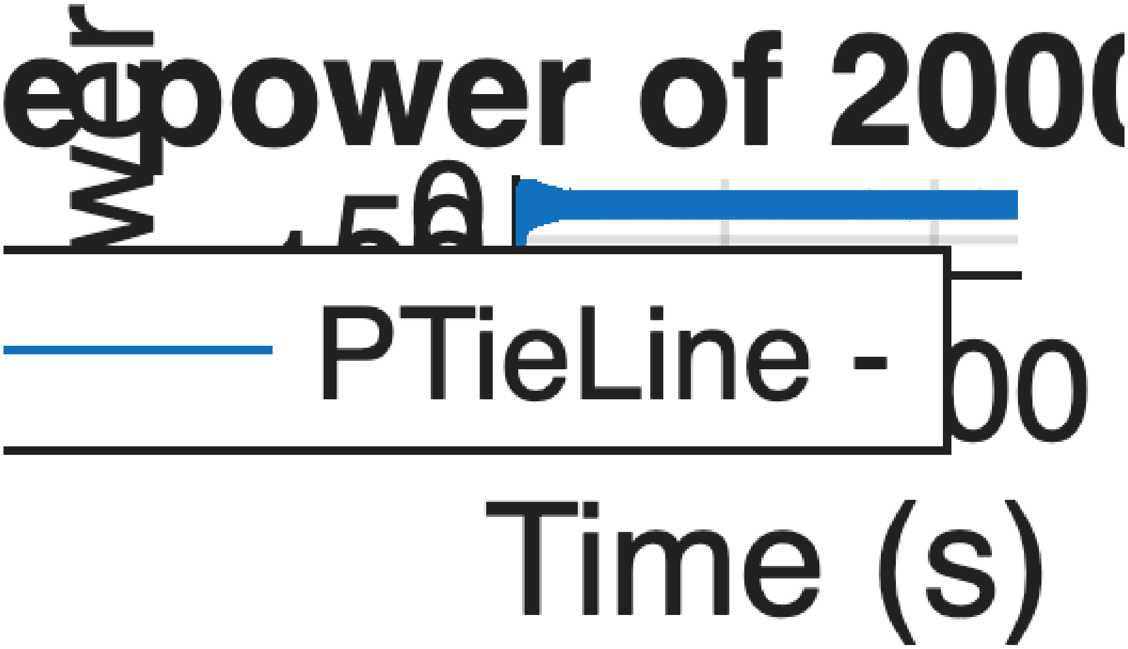
```
scopeNames = {'Pm1Scope','Pm2Scope','PScope'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end

xlabel('Time (s)');
ylabel('Power');
title('Overlay of All System 1 Power');
legend('show', 'Interpreter', 'none');
```



```
scopeNames = {'Pm1Scope1','Pm2Scope1','PScope1'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end


xlabel('Time (s)');
ylabel('Power');
title('Overlay of All System 2 Power');
legend('show', 'Interpreter', 'none');
```



```
scopeNames = {'PTieLine'};

figure; hold on; grid on;

for i = 1:numel(scopeNames)
    name = scopeNames{i};

    % Try to get dataset directly from 'out'
    try
        ds = out.get(name);
    catch
        % Otherwise get it from logsout
        ds = out.logsout.get(name);
    end

    % Plot each signal in this scope
    for j = 1:ds.numElements
        sig = ds.get(j);
        plot(sig.Values.Time, sig.Values.Data, 'DisplayName', [name ' - '
sig.Name]);
    end
end


xlabel('Time (s)');
ylabel('Power');
title('Tie Line power of 2000MW system');
legend('show', 'Interpreter', 'none');
```



```
% Adding additional controls, we are able to get the freqency to 0 and have
% the tie line Power stabilize and oscillate around 0
% some problems we notice is how quick the responses are and the
% oscillations.
% These can be mitigated by adding some delays and ramp controls, as well
% as fine tuning the control paramters of the model further.
```

```
% R1 = 0.0060 * 2 * pi % rad / s MW
% R2 = 0.0120 * 2 * pi % rad / s MW
%
%
% M = 1.1141e+08 / 10^6 % convert to MW s^2 / rad
% D = 20 / ( 2 * pi) % MW s / rad
%
% B = 1/R1 + 1/R2 + D
%
% T = 20000
% K = 0.01
```