# Lec 4 Spyder Test

No amp

A screenshot of a graph

AI-generated content may be incorrect.

No amp

A screenshot of a graph

AI-generated content may be incorrect.

1e3 supposeldy

A diagram of a graph

AI-generated content may be incorrect.

% ----- Parameters -----

amp\_min = 1; % amplitude at start of ramp

amp\_max = 1e2; % amplitude at end of ramp

ramp\_start\_frac = 0.3; % fraction of vector where ramp starts (30%)

% ----------------------

N = length(in);

% Define ramp start and end indices

start\_idx = floor(ramp\_start\_frac \* N); % start of ramp

end\_idx = N; % end of ramp

% Initialize amplitude vector

amp = ones(N,1) \* amp\_min; % default amplitude = amp\_min

% Logarithmic ramp

ramp\_len = end\_idx - start\_idx + 1;

ramp\_idx = 0:(ramp\_len-1); % indices for ramp

amp\_ramp = 10.^( log10(amp\_min) + (log10(amp\_max)-log10(amp\_min)) \* (ramp\_idx/(ramp\_len-1)) );

% Apply ramp

amp(start\_idx:end\_idx) = amp\_ramp;

% Scale input

in\_scaled = in .\* amp;

% Optional: plot amplitude envelope

figure;

plot(amp);

xlabel('Sample index'); ylabel('Amplitude multiplier');

title('Logarithmic Amplitude Ramp');

grid on;

# Chirp

## tmax = 1s, ts = 30e6 =

#### 1 Hz to 10 kHz (10e4)

A screenshot of a computer screen

AI-generated content may be incorrect.

#### 1 Hz to 100 kHz (10e5)

A screenshot of a computer screen

AI-generated content may be incorrect.

#### 1 Hz to 1 MHz (10e6)

A screenshot of a computer

AI-generated content may be incorrect.

## Testing time

Tmax = 1s

A screenshot of a computer screen

AI-generated content may be incorrect.

Tmax = 10s

A screenshot of a computer

AI-generated content may be incorrect.

### 1Hz to 10 kHz, fs = 10\*fmax, tmax = 30s

A screenshot of a computer screen

AI-generated content may be incorrect.

(tfestimate didn’t compute, probably too much information)

looks like no meaningful information for first 15s or so, can probably start from higher than 1hz

### 10 Hz to 10 kHz, fs = 10\*fmax, tmax = 30s

A blue and white graph

AI-generated content may be incorrect.

(still no bode plot)

### 10 Hz to 1 kHz, tmax = 5s (try to get it to run)

A blue graph with numbers and lines

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

Finally bode plot generates within <20s

### 10 Hz to 10 kHz, tmax = 5s (GOOD)

A screenshot of a computer screen

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

(took ~1min to solve but we got there)

### 100 Hz to 10 kHz, tmax = 5s ; tfestimate(2,4)

A blue and white graph

AI-generated content may be incorrect.

A screenshot of a computer

AI-generated content may be incorrect.

Took ~2min to compute

Complete garbage, so lets stick to 10Hz minimum lol

### 10 Hz to 10 kHz, tmax = 5s ; tfestimate(1,4)

A screen shot of a computer

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

This is kinda cooked so we should keep tfestimate(-1,4)

### 10 Hz to 100 kHz, tmax = 5s ; tfestimate(-1,5)

A screen shot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

Took like 30mins to compute and it’s garbage, so probably stick to 10^4

### (bad) 10 Hz to 10 kHz, tmax = 5, tfestimate(-1,4)

A screen shot of a computer

AI-generated content may be incorrect.

A graph of a diagram

AI-generated content may be incorrect.

### 1 to 10e4, tmax = 5, tfestimate(-1,4)

A blue graph with a blue line

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(-1,4)

A screenshot of a computer

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

20s to compile

### 10 to 1e4, tmax = 5, tfestimate(1,4)

A screenshot of a computer screen

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

## Playing with scaling input

### 10 to 1e4, tmax = 5, tfestimate(1,4), hard 10x (1e3 to 1e4)

A screenshot of a graph

AI-generated content may be incorrect.

Definitely bad

### 10 to 1e4, tmax = 5, tfestimate(1,4), linear 10x (1e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(1,4), log 10x (1e3 to 1e4)

A diagram of a signal

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(1,4), log 100x (1e3 to 1e4)

A graph of a diagram

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(1,4), log 100x (2e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(1,4), log 1000x (2e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(1,4), log 1e4 (2e3 to 1e4)

A screenshot of a computer screen

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

Uhhh wtf

A screenshot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, tfestimate(1,4), log 1e3 (3e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

### A screenshot of a graph AI-generated content may be incorrect.10 to 1e4, tmax = 5, tfestimate(1,4), log 1e4 (3e3 to 1e4)

A screenshot of a computer

AI-generated content may be incorrect.A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e5, tmax = 5, tfestimate(1,5), log 1e3 (2e3 to 1e4)

A screenshot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

(took maybe 2mins)

### 10 to 1e5, tmax = 5, tfestimate(1,5), log 1e4 (2e3 to 1e5)

A graph of a signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.(3.5 minutes for this garbage)

## Sample Time

### 10 to 1e4, 10s, log 1e3 (2e3 to 1e4)

A screenshot of a computer screen

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

### 10 to 1e4, 10s, log 1e3 (1e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, 10s, no scaling

A screenshot of a graph

AI-generated content may be incorrect.A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, 10s, log 1e1 (2e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.A diagram of a body diagram

AI-generated content may be incorrect.

### 10 to 1e4, 10s, log 1e2 (2e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e5, 10s, log 1e2 (2e3 to 1e4)

A graph of a function

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

Unlikely that there are modes past 1e4

Frd

A graph of a diagram

AI-generated content may be incorrect.

A graph of a body diagram

AI-generated content may be incorrect.

## Windowing Chirp

### No scaling

A graph of a signal

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### 10 to 1e4, tmax = 5, log 1e3 (2e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a window

AI-generated content may be incorrect.

### 10 to 1e5, tmax = 5, log 1e3 (2e3 to 1e4)

A graph of a signal

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a diagram

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### Hanning window (don’t use)

A screenshot of a graph

AI-generated content may be incorrect.

### Rectangular window

A graph of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.



A screenshot of a graph

AI-generated content may be incorrect.

A graph of a window

AI-generated content may be incorrect.

A graph of a window

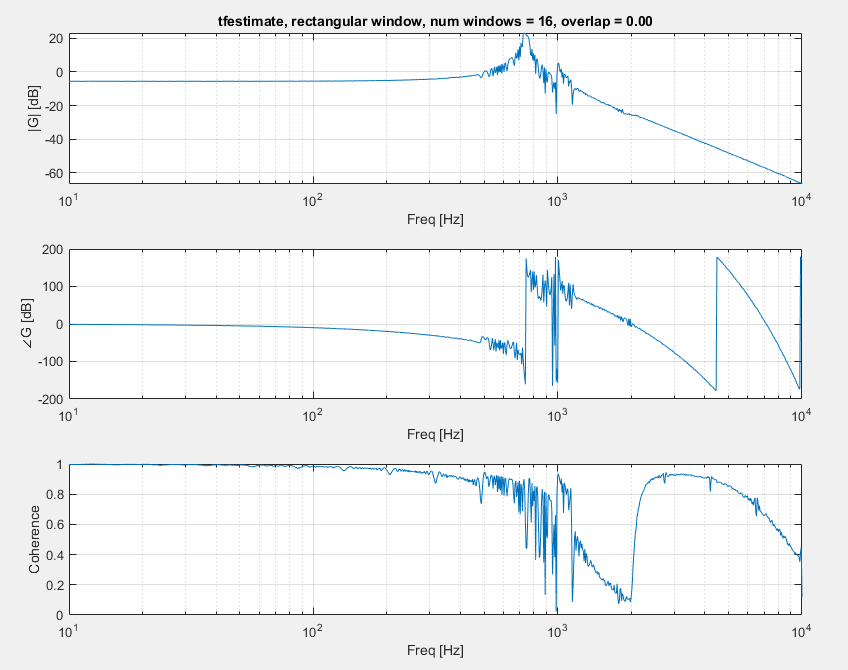
AI-generated content may be incorrect.

A graph of a window

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.



A screenshot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

# White Noise

### Fs = 1e5, tmax = 5, vr = 1, tfestimate(1,4)

A screenshot of a computer screen

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

### Fs = 1e5, tmax = 5, vr = 1, tfestimate(-1,4)

A blue and white sound waves

AI-generated content may be incorrect.A screenshot of a graph

AI-generated content may be incorrect.

### Fs = 1e5, tmax = 5, vr = 5, tfestimate(-1,4)

A screenshot of a computer screen

AI-generated content may be incorrect.

### A graph of a graph AI-generated content may be incorrect. Fs = 1e5, tmax = 5, vr = 10, tfestimate(-1,4)

A screenshot of a computer screen

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

## Windowing

### Fs = 1e5, tmax = 5, vr = 10,

A blue and white sound waves

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

### Proper Hanning

A screenshot of a computer screen

AI-generated content may be incorrect.

No windowing

A graph of a graph

AI-generated content may be incorrect.

A graph of a number of objects

AI-generated content may be incorrect.

A graph of a number of objects

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

## One last check for higher order modes

A blue and white noise signal

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

# Tfest

Idk what I’m doing

A diagram of a graph

AI-generated content may be incorrect.

Using 2nd line, 4 poles 2 zeros

A diagram of a diagram

AI-generated content may be incorrect.

A diagram of a phase diagram

AI-generated content may be incorrect.

A screenshot of a computer

AI-generated content may be incorrect.

A screenshot of a computer

AI-generated content may be incorrect.

A screenshot of a computer

AI-generated content may be incorrect.

### No scaling

A graph of a frequency

AI-generated content may be incorrect.

A screenshot of a computer

AI-generated content may be incorrect.

Using first like (iddata)

### Uhhh thanks gpt

A diagram of a diagram

AI-generated content may be incorrect.

Error in JX\_MSD2025\_Part1\_SystemIdentification (line 136)

bode(Ptf,data) %Plant Transfer Function from Identification

Unrecognized function or variable 'dataFRD'.

Error in JX\_MSD2025\_Part1\_SystemIdentification (line 149)

bode(sys, dataFRD); % overlay fitted model and measured data

## Tuning iodelay

### 1e-3, 5p3z

A graph of a function

AI-generated content may be incorrect.

### 1e-4, actually good result with white noise

A blue line graph with numbers and a few black text

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a diagram

AI-generated content may be incorrect.

### 10 to 1e4 chirp, 10s, log 1e2 (2e4 to 1e4), no windowing

A graph of a signal

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

#### Iodelay = 1

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 1e-1

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 1e-2

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 1e-3

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 1e-5

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 0

A diagram of a diagram

AI-generated content may be incorrect.

#### Iodelay = 1e-4

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 1.5e-4

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 2e-4

A diagram of a graph

AI-generated content may be incorrect.

Iodelay = 2.5e-4

A diagram of a body diagram

AI-generated content may be incorrect.

Iodelay = 3e-4

A diagram of a body diagram

AI-generated content may be incorrect.

Iodelay = 4e-4

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay = 5e-4

A diagram of a function

AI-generated content may be incorrect.

Iodelay 9e-5

A diagram of a diagram

AI-generated content may be incorrect.

Iodelay 8e-5

A diagram of a body diagram

AI-generated content may be incorrect.

Iodelay 7e-5

A diagram of a number of objects

AI-generated content may be incorrect.

## White noise, tuning poles & zeros

A screenshot of a graph

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

## Chirp, tuning poles & zeros

A graph of a signal

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

5p 2z

A graph of a function

AI-generated content may be incorrect.

6p3z

A graph of a plot

AI-generated content may be incorrect.

7p4z

A graph of a graph showing a number of different types of data

AI-generated content may be incorrect.

## Adding Time Delay

### 10 to 3e3, chirp, w time delay

A graph of a function

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

A screen shot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

# Good Stuff

### Tfest with Chirp

Iodelay = 2e-4

A diagram of a graph

AI-generated content may be incorrect.

### Tfest with White noise, no windowing

A screenshot of a graph

AI-generated content may be incorrect.

A screenshot of a graph

AI-generated content may be incorrect.

Tfest 2e-4

A diagram of a function

AI-generated content may be incorrect.

Same thing

#### With windowing

A graph of a graph

AI-generated content may be incorrect.

A diagram of a body diagram

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

A graph of a graph

AI-generated content may be incorrect.

A diagram of a body diagram

AI-generated content may be incorrect.

A graph of a function

AI-generated content may be incorrect.

# Questions for Jesse

* Amplitude increasing at high freq?
* Taking multiple chirps and then averaging?
* What windowing

Things to do

* Try Jesse’s python settings and seeing if diff results
  + 120s long chirp signal, 10 to 5e3, ts = 30us