## Contents



```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
%       determine the relationship between power and volume for each design
%
% Assigment Information
%   Assignment:     PS 05, Problem 2
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%   Team ID:        001-05
%       Contributor:    Name, login@purdue [repeat for each]
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

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## INITIALIZATION

```
%import all information from the csv file
allData= importdata('Data_volume_power.csv');
%assign variables
%power input in[mW]
power=allData.data(:,1);
%volume output by OEP4
volOEP4=allData.data(:,2);
%volume output by IEP3
volIEP3=allData.data(:,3);
```

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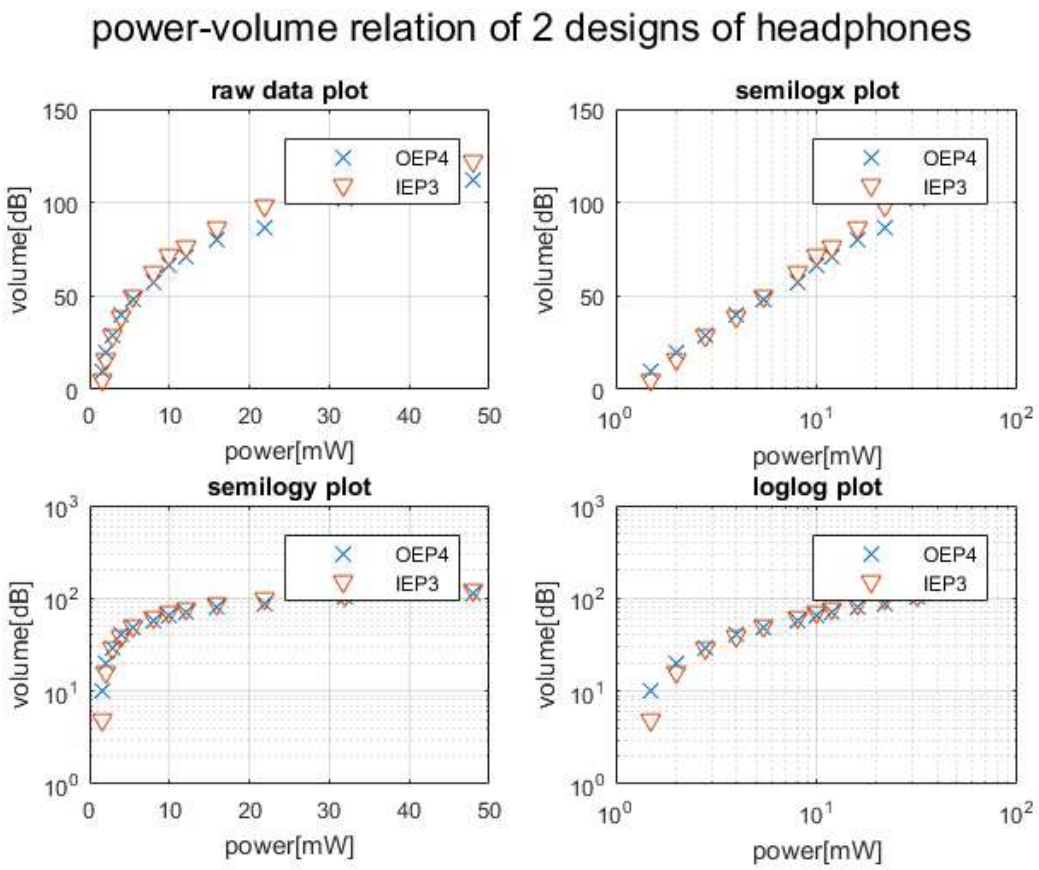
## SUBPLOT FIGURE

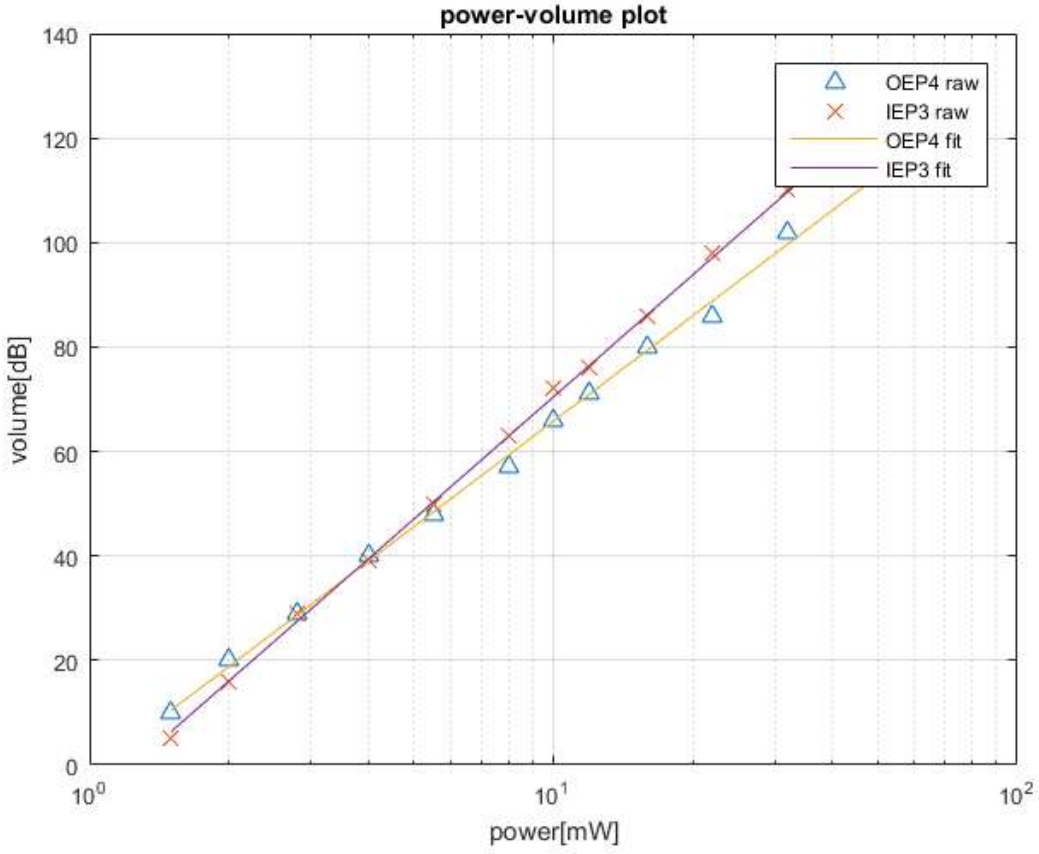
```
%plot raw data
subplot(2,2,1);
plot(power,volOEP4,'x');
hold on;
plot(power,volIEP3,'v');
grid on;
xlabel('power[mW]');
ylabel('volume[dB]');
title('raw data plot');
legend('OEP4','IEP3');
set(gca,'FontSize',8);
%plot semelogx
subplot(2,2,2);
semilogx(power,volOEP4,'x');
hold on;
semilogx(power,volIEP3,'v');
grid on;
xlabel('power[mW]');
ylabel('volume[dB]');
title('semilogx plot');
legend('OEP4','IEP3');
set(gca,'FontSize',8);
%plot semilogy
subplot(2,2,3);
semilogy(power,volOEP4,'x');
hold on;
semilogy(power,volIEP3,'v');
grid on;
xlabel('power[mW]');
ylabel('volume[dB]');
title('semilogy plot');
legend('OEP4','IEP3');
set(gca,'FontSize',8);
%plot loglog
subplot(2,2,4);
loglog(power,volOEP4,'x');
hold on;
loglog(power,volIEP3,'v');
grid on;
xlabel('power[mW]');
ylabel('volume[dB]');
title('loglog plot');
legend('OEP4','IEP3');
set(gca,'FontSize',8);
suptitle('power-volume relation of 2 designs of headphones');
```




## LINEARIZATION

```
%using semelogx plot, which is most close to line.
%calculate regression lines' coeffieient
logxCoefOEP4=polyfit(log10(power),volOEP4,1);
logxCoefIEP3=polyfit(log10(power),volIEP3,1);
%print linearized equation
fprintf('The LINEARIZED function of power-volume of OEP4 is: Y = X*%.2f %.2f\n',logxCoefOE
P4);
fprintf('The LINEARIZED function of power-volume of IEP3 is: Y = X*%.2f %.2f\n',logxCoefIE
P3);
%plot data and regression lines in a l scale
figure;
semilogx(power,volOEP4,'^');
hold on;
semilogx(power,volIEP3,'x');
semilogx(power,log10(power)*logxCoefOEP4(1)+logxCoefOEP4(2));
semilogx(power,log10(power)*logxCoefIEP3(1)+logxCoefIEP3(2));
hold off;
legend('OEP4 raw','IEP3 raw','OEP4 fit','IEP3 fit');
grid on;
xlabel('power[mW]');
ylabel('volume[dB]');
title('power-volume plot');
set(gca,'FontSize',8);
```

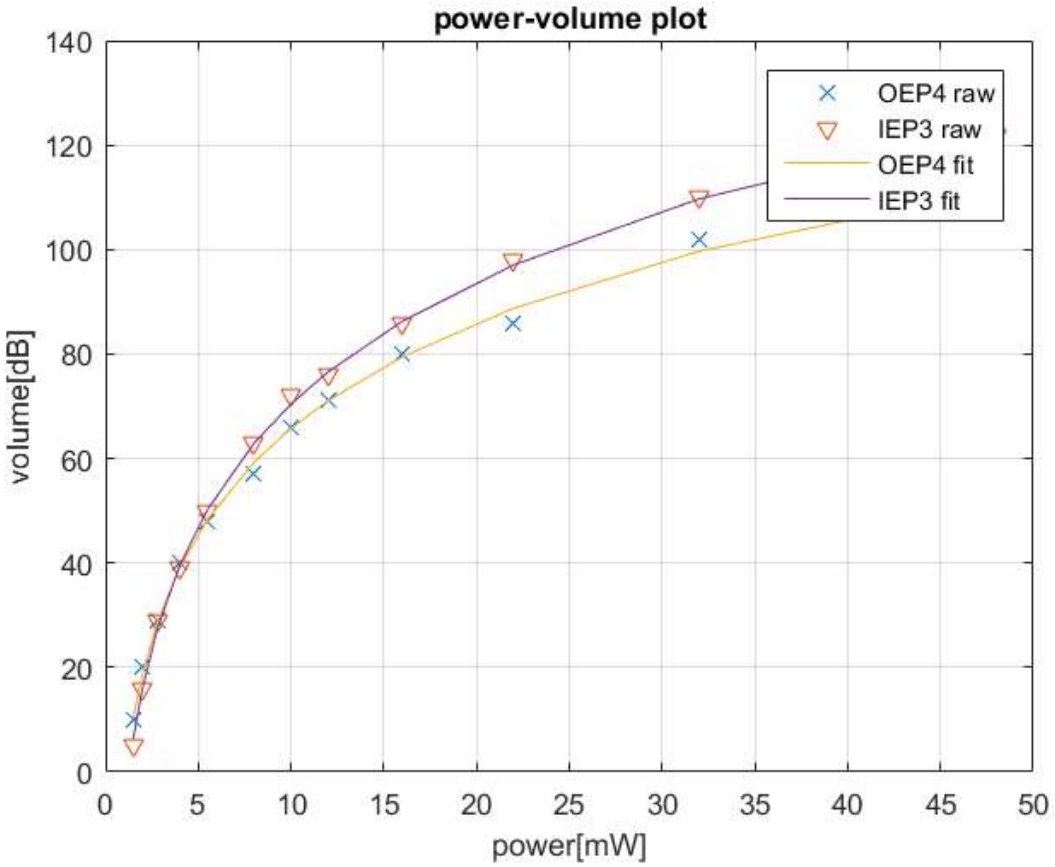
```
The LINEARIZED function of power-volume of OEP4 is: Y = X*67.13 -1.35
The LINEARIZED function of power-volume of IEP3 is: Y = X*77.75 -7.32
```




## HEADPHONE DESIGN MODELS

```
%print general function in form volume=f(power)
fprintf('The function of power-volume of OEP4 is: volume = log10(power)*%.2f %.2f\n',logxC
oefOEP4);
fprintf('The function of power-volume of IEP3 is: volume = log10(power)*%.2f %.2f\n',logxC
oefIEP3);
%plot the original data with the best-fit curve for each of the headphone designs.
figure;
plot(power,volOEP4,'x');
hold on;
plot(power,volIEP3,'v');
plot(power,log10(power)*logxCoefOEP4(1)+logxCoefOEP4(2));
semilogx(power,log10(power)*logxCoefIEP3(1)+logxCoefIEP3(2));
legend('OEP4 raw','IEP3 raw','OEP4 fit','IEP3 fit');
grid on;
xlabel('power[mW]');
ylabel('volume[dB]');
title('power-volume plot');
```

```
The function of power-volume of OEP4 is: volume = log10(power)*67.13 -1.35
The function of power-volume of IEP3 is: volume = log10(power)*77.75 -7.32
```




## PREDICTION CALCULATIONS

```
predPower=[25,40,50];
predOEP4=log10(predPower)*logxCoefOEP4(1)+logxCoefOEP4(2);
predIEP3=log10(predPower)*logxCoefIEP3(1)+logxCoefIEP3(2);
```

## ANALYSIS

### -- Q1

semelogx plot best shows the relation between the power input and the volume because semilogx plot is most close to lines.

### -- Q2

OEP4 25mW: 92.4914 dB 40mW: 106.1935 dB 50mW: out of the range of the model IEP3 25mW: 101.368 dB 40mW: 117.2377 dB 50mW: out of the range of the model

### -- Q3

```
The IEP3 is more sensitive because due to same power incerase, the
volime increase of IEP3 is more than OEP4.
```

## ACADEMIC INTEGRITY STATEMENT

I/We have not used source code obtained from any other unauthorized source, either modified or unmodified. Neither have I/we provided access to my/our code to another. The project I/we am/are submitting is my/our own original work.

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