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```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENGR 132
% Program Description
% This program calculates the power-volume relation for using a model
% function for head phones. Moreover, the program plots the
% power-volume relation as a graph for further analysis.
%
% Assignment Information
%   Assignment:      PS 03, Problem 2
%   Author:         Tomoki Koike, koike@purdue.edu
%   Team ID:        002-08
%   Contributor:    no contributor
%   My contributor(s) helped me:
%       [ ] understand the assignment expectations without
%           telling me how they will approach it.
%       [ ] understand different ways to think about a solution
%           without helping me plan my solution.
%       [ ] think through the meaning of a specific error or
%           bug present in my code without looking at my code.
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

INITIALIZATION

```
%Import data
volPowData = csvread('Data_volume_power.csv', 2,0);

%Set variable to each column
powCol = volPowData(:,1); %The columns of the power values
ope4col = volPowData(:,2); %The columns of the OPE4 volumes
iep3col = volPowData(:,3); %The columns of the IPE3 volumes
```

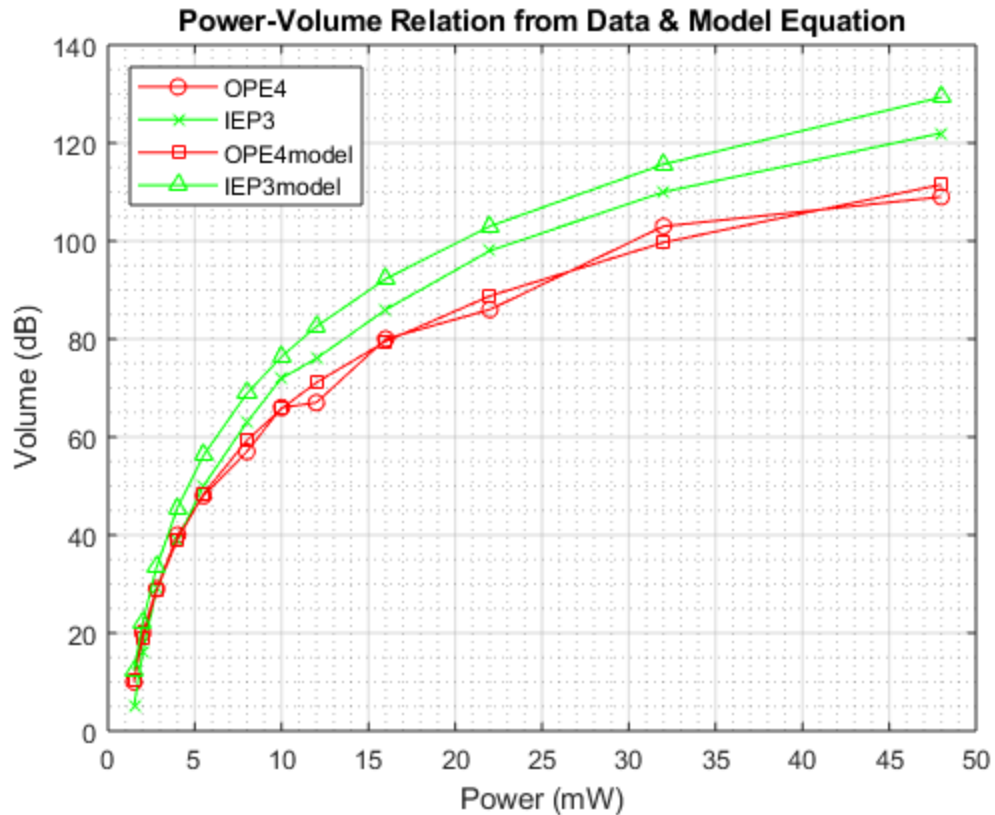
CALCULATIONS

```
% Calculation of the volume of the headphones using the modeled
% equation.
% OEP4
vOEP4 = 67.1*log10(powCol)-1.3; %model calculation for OPE4
% IEP3
vIEP3 = 77.7*log10(powCol)-1.3; %model calculation for IPE3
```

FORMATTED FIGURE

```
% Plotting the data of the original power-volume relation and
% overlaying by the modeled power-volume relation.

plot(powCol,ope4col,'-or') % power and volume of OPE4 from data
grid on                  % turning on the grid
grid minor               % adding minor gridlines
xlabel('Power (mW)')      % adding x-axis label
ylabel('Volume (dB)')     % adding y-axis label
hold on                  % holding the plot to add more
plot(powCol,iep3col,'-xg') % power and volume of IPE3 from data
plot(powCol,vOEP4,'-sr')  % power and volume of OPE4 from model
plot(powCol,vIEP3,'-^g')  % power and volume of IPE3 from model
legend('OPE4','IEP3','OPE4model','IEP3model','location','northwest')
                        % adding legends and determining its
                        % location
title('Power-Volume Relation from Data & Model Equation')
                        % adding the title of the graph
hold off                 % turning off the hold command
```



ANALYSIS

-- Q1

By examining the graph, the model line for the OPE4 headphone accords more to the curve plotted by the data. Thus, OPE4's model best fits its data.

-- Q2

By visualizing a tangent line on both model lines, it is fair to say that the model line of IEP3 would have a tangent line with a larger slope. Therefore, IEP3 has more sensitivity.

-- Q3

At a volume of 60 dB the OPE4 headphone requires a power of approximately 6.2 mW, whereas IEP3 requires 8.0 mW. This tells that at 60 dB OPE4 is superior in terms of battery longevity. However, at 30 dB OPE4 requires about 2.5 mW and IEP3 requires 3.0 mW which is not that large difference. Nonetheless, from the graph OPE4 headphone may last slightly longer than IEP3.

ACADEMIC INTEGRITY STATEMENT

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

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