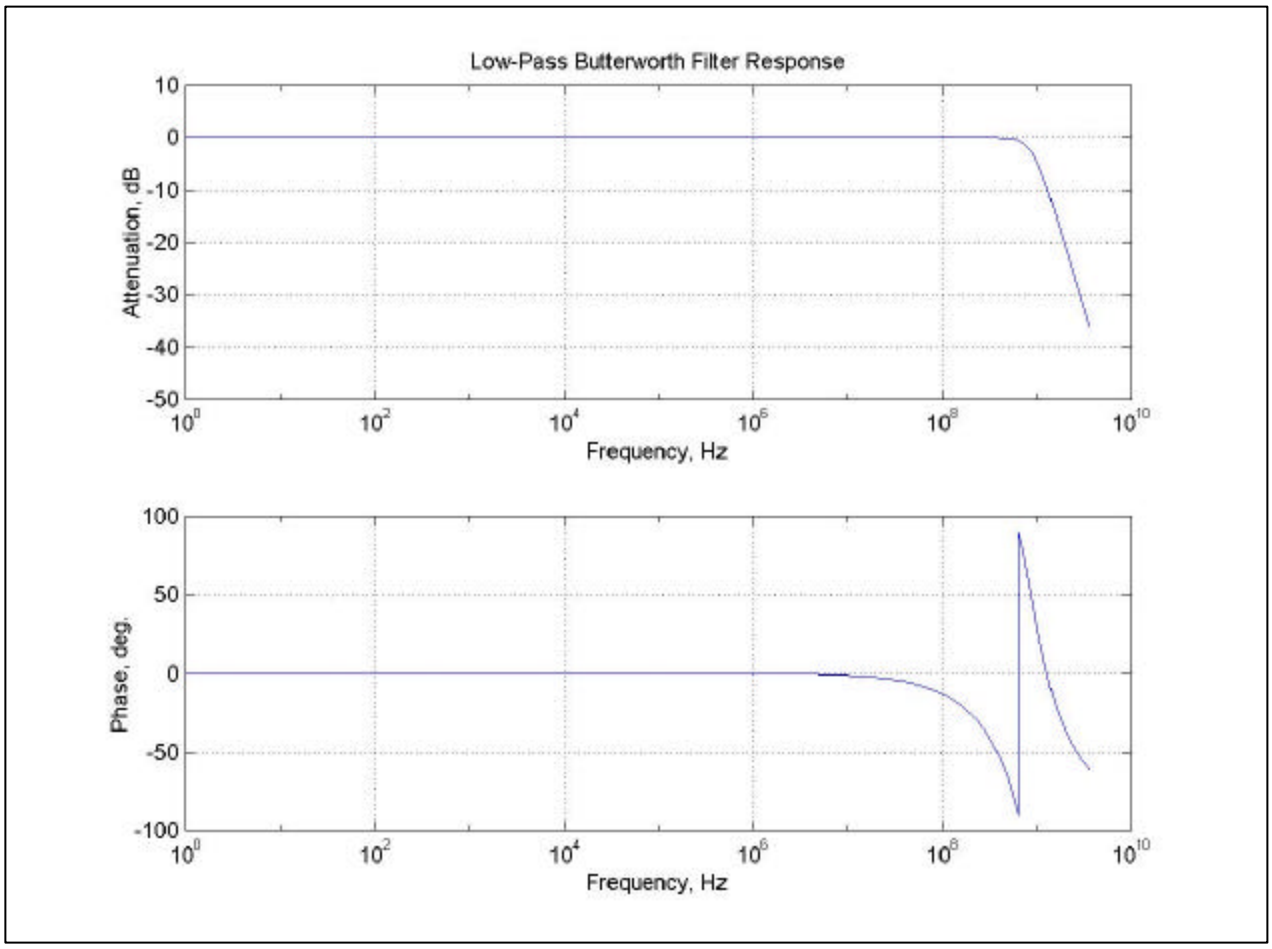
Example 5-3 p 229 MatLab Result:
Second Order Butterworth Low-Pass Filter w/ f_c = 900 MHz

```
% Example 5-3 p 229:  Butterworth Low-Pass Filter
%

close all; % close all opened graphs
clear all; % clear all variables
figure;    % open new graph

% Normalized components from filter coefficient tables
Ln1 = 1.;  %  Normalized Inductance
Ln2 = 1.;  %  Normalized Inductance
Cn1 = 2.;  %  Normalized Capacitance
Rg = 50;    % Source resistance
RL = 50;     % Load Resistance

wc=2*pi*900e6;  % Cutoff Frequency of 900 MHz

L1=Ln1*RL/wc;  %  Actual L1 value
L2=Ln2*RL/wc;  %  Actual L2 value
C1=Cn1/(RL*wc);  %  Actual C1 value

f = 1;
for i=1:4000;
        w=2*pi*f;
        ZL1=j*w*L1;
        ZL2=j*w*L2;
        ZC1=1./(j*w*C1);
        YC1=1./ZC1;
        GL=1./RL;

        % Define the ABCD matrices for each element of the filter

        A0=[1 Rg;0 1];
        A1=[1 ZL1;0 1];
        A2=[1 0;YC1 1];
        A3=[1 ZL2;0 1];
        A4=[1 0;GL 1];

        ABCD=A0*A1*A2*A3*A4;
        freq(i)=f;
        H(i)=2.*1/(ABCD(1));

        f=f+0.001*wc/(2*pi);
end

subplot(211), semilogx(freq,20*log10(abs(H)));grid on; ylim([-50 10]);
title('Low-Pass Butterworth Filter Response');
xlabel('Frequency, Hz');
ylabel('Attenuation, dB');

phase=atan(imag(H)./real(H));
subplot(212), semilogx(freq,phase/pi*180);grid on;
xlabel('Frequency, Hz');
ylabel('Phase, deg.');
```


Low-Pass Butterworth Filter Response
Attenuation, dB
10
0
-10
-20
-30
-40
-50
10^0
10^2
10^4
10^6
10^8
10^{10}
Frequency, Hz
Phase, deg.
100
50
0
-50
-100
10^0
10^2
10^4
10^6
10^8
10^{10}
Frequency, Hz