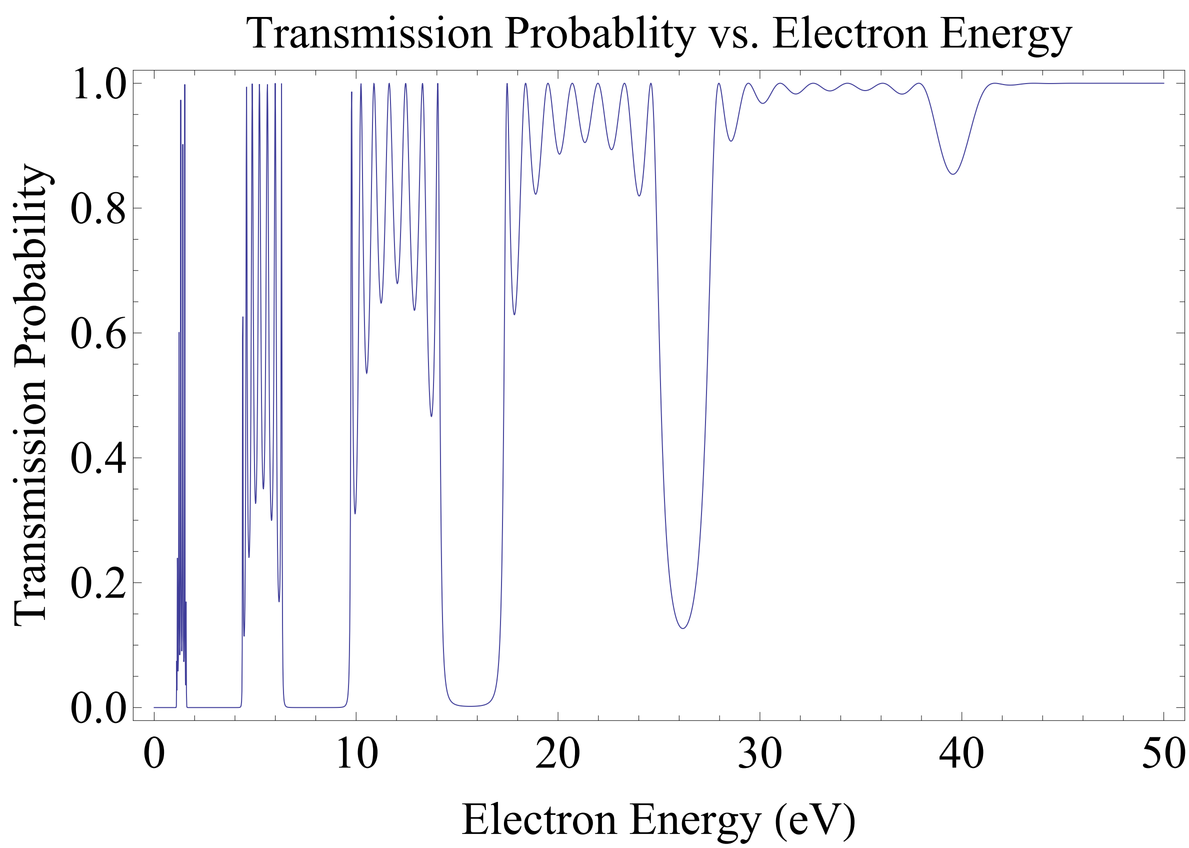
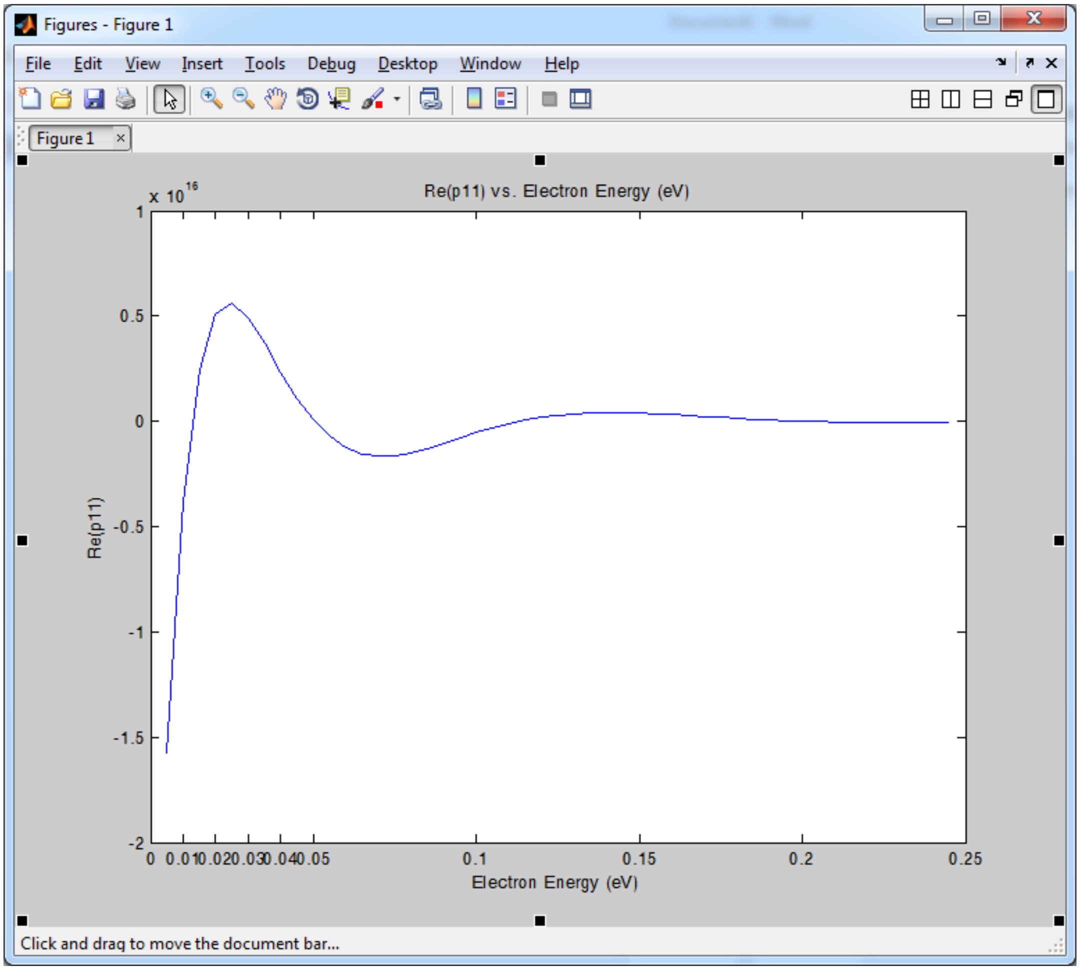
```
LbCount = 0;
LwCount = 0;
A = {{1, 0}, {0, 1}};
For[i = 0, i ≤ 15, i++,
 If[EvenQ[i], A = A.(Inverse[{{Exp[I (LwCount * Lw + LbCount * Lb) * kf],
          Exp[-I (LwCount * Lw + LbCount * Lb) * kf]},
         {kf * Exp[I * (LwCount * Lw + LbCount * Lb) * kf],
          -kf * Exp[-I * (LwCount * Lw + LbCount * Lb) * kf]}}].
       {{Exp[I (LwCount * Lw + LbCount * Lb) * kp], Exp[-I (LwCount * Lw + LbCount * Lb) *
            kp]}, {kp * Exp[I * (LwCount * Lw + LbCount * Lb) * kp],
         -kp * Exp[-I * (LwCount * Lw + LbCount * Lb) * kp]}}),
  A = A.(Inverse[{{Exp[I (LwCount * Lw + LbCount * Lb) * kp],
          Exp[-I (LwCount * Lw + LbCount * Lb) * kp]},
         {kp * Exp[I * (LwCount * Lw + LbCount * Lb) * kp],
          -kp * Exp[-I * (LwCount * Lw + LbCount * Lb) * kp]}}].
       {{Exp[I (LwCount * Lw + LbCount * Lb) * kf], Exp[-I (LwCount * Lw + LbCount * Lb) *
            kf]}, {kf * Exp[I * (LwCount * Lw + LbCount * Lb) * kf],
         -kf * Exp[-I * (LwCount * Lw + LbCount * Lb) * kf]}})];
 If[EvenQ[i], LbCount = LbCount + 1, LwCount = LwCount + 1];]

m = 511 * 10^3 / (2.998 * 10^8)^2; (* mass of an electron in keV/c^2 *)
V = 10; (* Potential energy in eV *)
hb = 6.582 * 10^-16; (* hbar in eV*s *)
kp = Sqrt[2 * m * (E0 - V) / hb^2];
kf = Sqrt[2 * m * E0 / hb^2];
Lw = .4 * 10^-9 ; (* Well width in nm *)
Lb = .1 * 10^-9;(* Barrier width in nm *)
p11 = A[[1]][[1]];
```

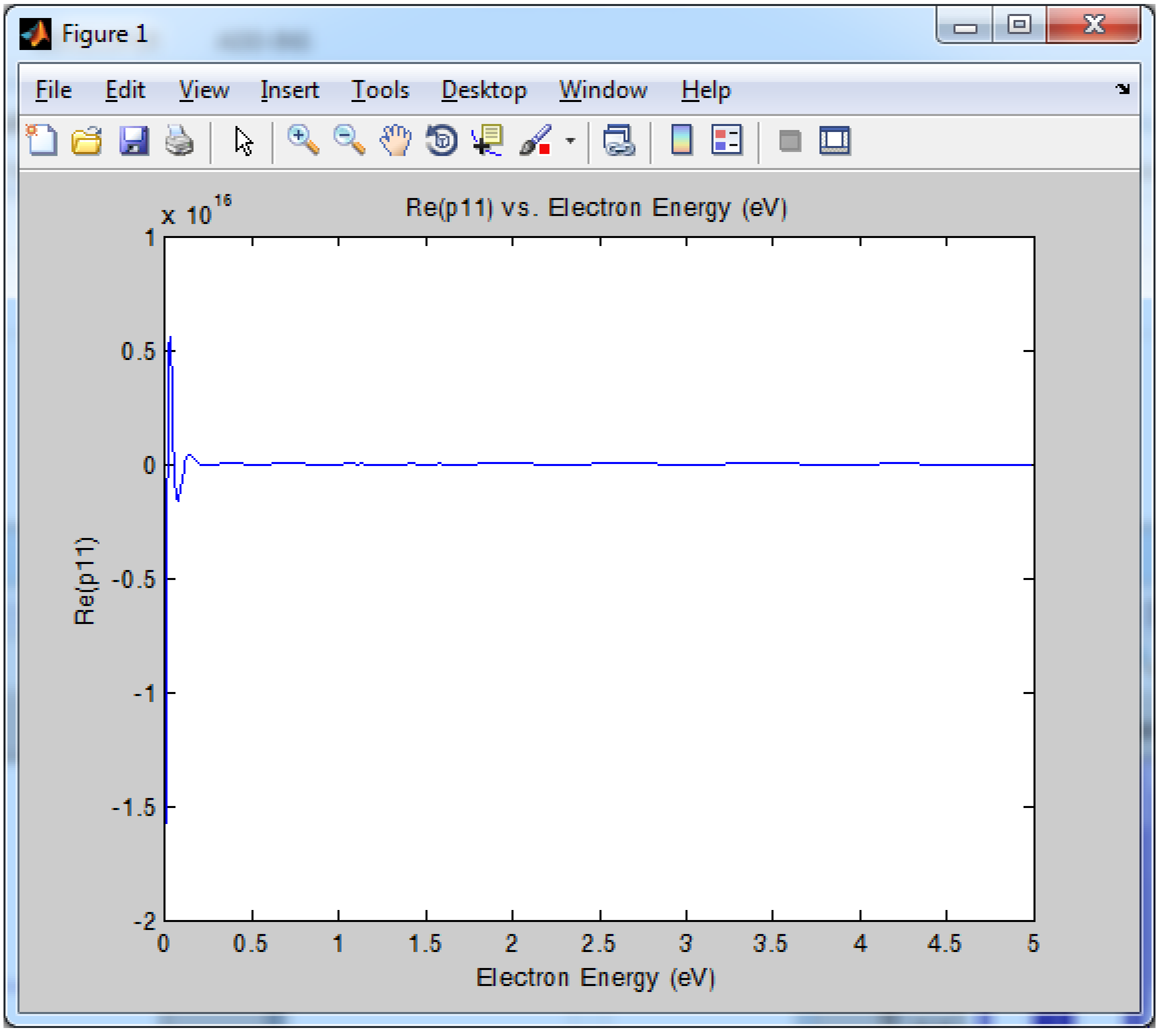
```
Plot[1 / (p11 * Conjugate[p11]), {E0, 0, 50},
 Frame → True, FrameLabel → {{"Transmission Probability", ""},
   {"Electron Energy (eV)", "Transmission Probablity vs. Electron Energy"}},
 LabelStyle → Directive[Large]]
```



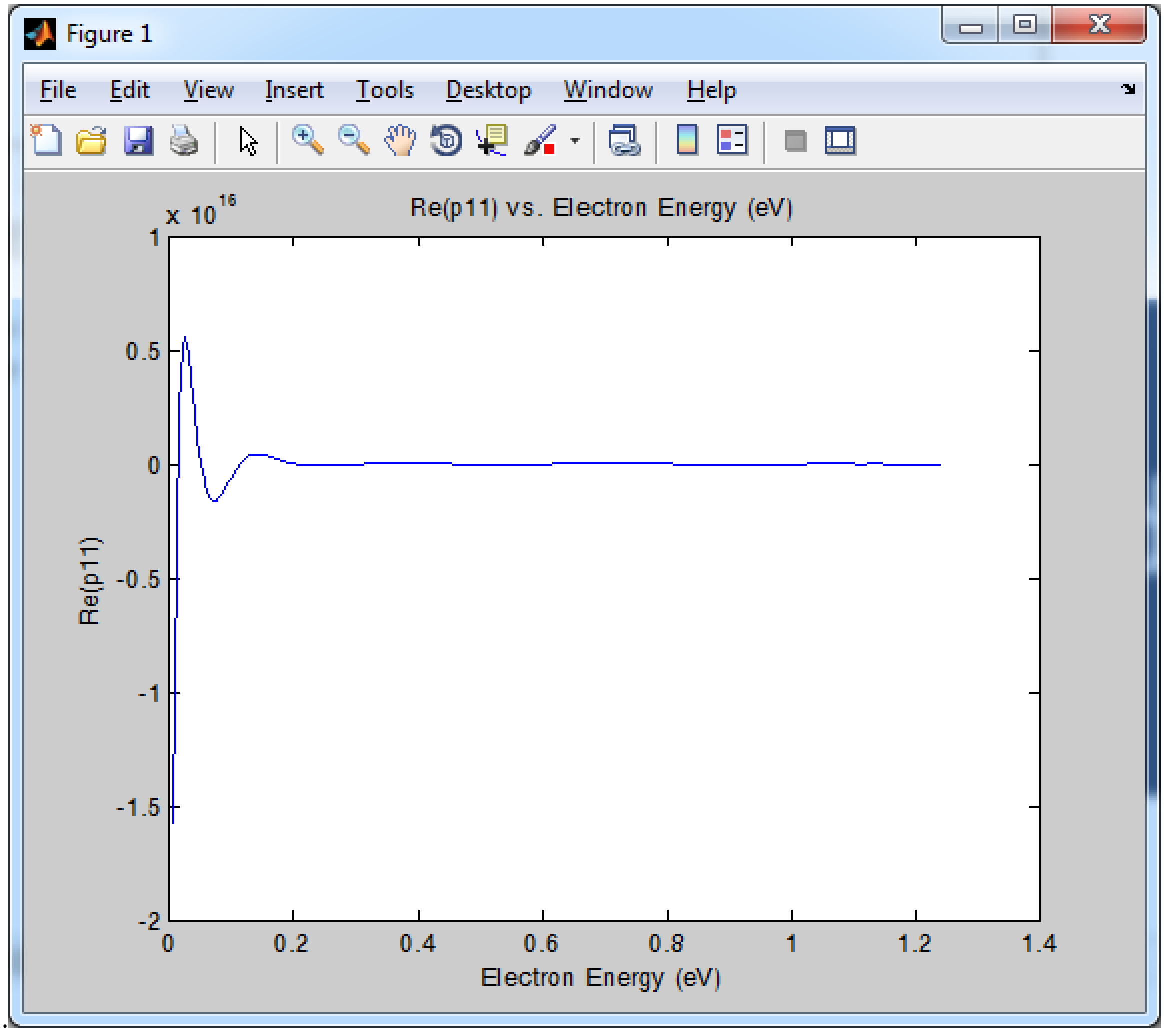

```
(*Plot[{Re[p11],Piecewise[{{Re[p11],-1≤Re[p11]≤1}},_]},
 {E0,0,30},Filling→ {2→{Axis,Yellow}},
 PlotStyle→{Green,Directive[Red,Thick,Style→Large]},Frame→True,FrameLabel→
  {{"Re[p11] ",""},{"Electron energy (eV)","Re[p11] vs. Electron Energy"}},
 RotateLabel→True,LabelStyle→Large]*)
```



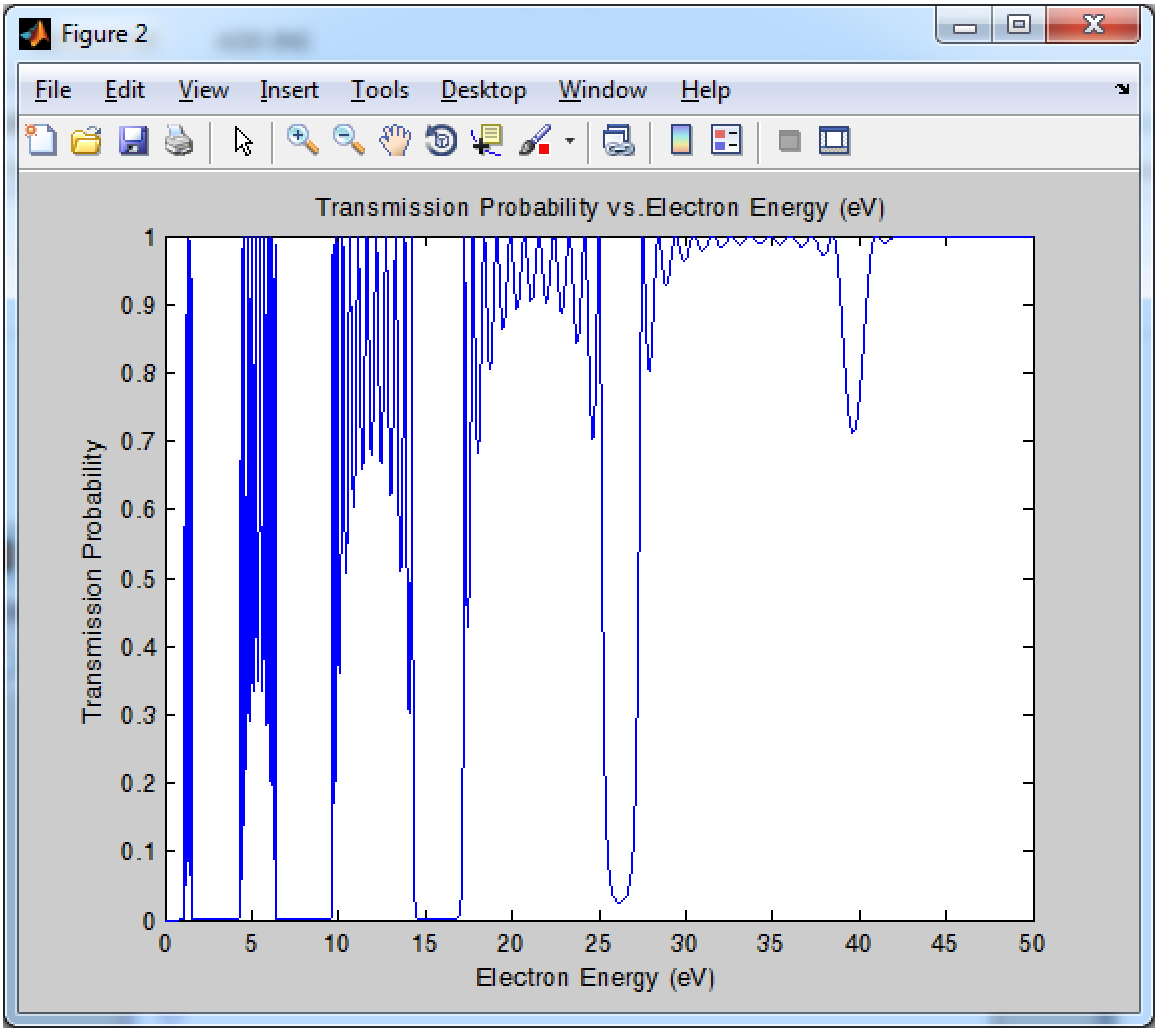
Zoomed in a lot.



Zoomed in moderately.



Zoomed far out



Transmission probability

```
ElEns = linspace(0,50,10^4);
p11 = zeros(1,length(ElEns));

for i = 1:length(ElEns)
    temp = Problem3(ElEns(i));
    p11(i) = temp(1,1);
end

figure(1),plot(ElEns(1:50),real(p11(1:50)))
title('Re(p11) vs. Electron Energy (eV)'),xlabel('Electron Energy (eV)'),ylabel('Re(p11)');

figure(2),plot(ElEns,abs(p11).^-2),
title(' Transmission Probability vs.Electron Energy (eV)'),
xlabel('Electron Energy (eV)'),ylabel('Transmission Probability');
```

```
function A = Problem3(E0)

A = [1,0 ; 0,1];
LwCount=0;
LbCount=0;
m = 511*10^3/(2.998*10^8)^2;
V = 10;
hb = 6.582*10^-16;
kp = sqrt(2*m*(E0 - V)/hb^2);
kf = sqrt(2*m*E0/hb^2);
Lw = .4*10^-9 ;
Lb = .1*10^-9;

for j = 0:23
 if mod(j,2)==0
    Ap=[exp(1i*(LwCount*Lw + LbCount*Lb)*kf),exp(-1i*(LwCount*Lw + LbCount*Lb)*kf);
        kf*exp(1i*(LwCount*Lw + LbCount*Lb)*kf), -kf*exp(-1i*(LwCount*Lw + LbCount*Lb) ↙
*kf)]\...
        ...
        [exp(1i*(LwCount*Lw + LbCount*Lb)*kp),exp(-1i*(LwCount*Lw + LbCount*Lb)*kp);
        kp*exp(1i*(LwCount*Lw + LbCount*Lb)*kp), -kp*exp(-1i*(LwCount*Lw + LbCount*Lb) ↙
*kp)];
    A = A*Ap;
    LbCount = LbCount + 1;
 else
     Af=[exp(1i*(LwCount*Lw + LbCount*Lb)*kp),exp(-1i*(LwCount*Lw + LbCount*Lb)*kp); ...
            kp*exp(1i*(LwCount*Lw + LbCount*Lb)*kp), -kp*exp(-1i*(LwCount*Lw + ↙
LbCount*Lb)*kp)]\...
            ...
            [exp(1i*(LwCount*Lw + LbCount*Lb)*kf),exp(-1i*(LwCount*Lw + LbCount*Lb) ↙
*kf);...
             kf*exp(1i*(LwCount*Lw + LbCount*Lb)*kf),-kf*exp(-1i*(LwCount*Lw + ↙
LbCount*Lb)*kf)];
     A = A*Af;
      LwCount = LwCount + 1;
 end
end
```