```
In[ ]:= SetDirectory@NotebookDirectory[];
        设置目录          当前笔记本的目录
        Import["QLanczos_package.m"];
        导入
```

Parameters

```
In[ ]:= d = 5;
        Id = IdentityMatrix[d];
             单位矩阵
        η = 1.5 * 10.^-15;(*machine precision*)

In[ ]:= ηList = Table[10.^j, {j, -15, 5, 0.1}];
                表格
```

Model

```
In[ ]:= Ham = HeisenbergHam;
```

Spectrum

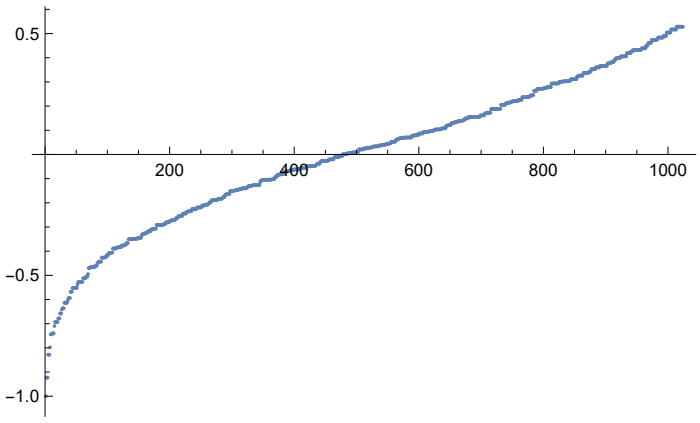
```
In[ ]:= {Λ, U} = funSpectrum[Ham];
        HamNorm = Max[Abs[Λ]]
                  ···  绝对值
        Λ = Λ / HamNorm;
        Eg = Λ[[1]]
Out[ ]= 17.0321

Out[ ]= -1.

In[ ]:= htot = 27. / HamNorm
Out[ ]= 1.58524

In[ ]:= ListPlot[Λ, PlotRange → Full]
        绘制点集      绘制范围      全范围
```

Out[ ]=



Reference state

```
In[ ]:= φ = φHeisenberg;
        φ = Flatten[Conjugate[U].φ];
            压平      共轭
        probφ = Abs[φ]^2;
                绝对值
```

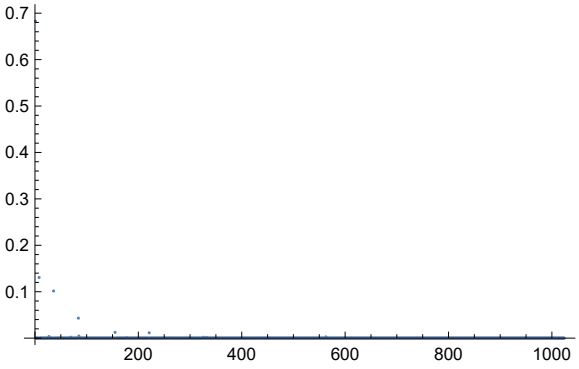
```
In[ ]:= pg = probφ[[1]](*pg>10^-3*)
        ER = Total[probφ * Λ];
             总计
        ϵR = ER - Eg
```

```
Out[ ]= 0.682614
```

```
Out[ ]= 0.119312
```

```
In[ ]:= ListPlot[probφ, PlotRange → Full]
        绘制点集          绘制范围      全范围
```

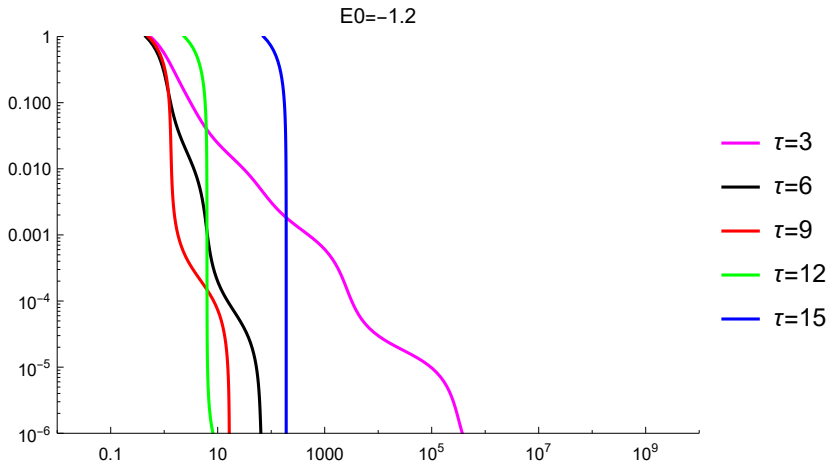
Out[ ]=



Gaussian-Power with different tau

In[ ]:=
```
costH = htot;
costS = 1;
E0 = Eg - 0.2;
τList = Table[i, {i, 3, 15, 3}];
        表格
τCurves = {};
Do[
Do循环
  τ = τList[[j]];
  {Hmat, Smat} = funMatGP[Λ, E0, τ, d, probφ, htot];
  {ϵList, γList} = funEpsilonGamma[Hmat, Smat, costH, costS, Id, ηList, Eg, pg];
  AppendTo[τCurves, Transpose[{γList, ϵList}]];
  附加                转置
  , {j, 1, Length[τList]}];
          长度
PR = {{1.*^-2, 1.*^10}, {1.*^-6, 1.*^0}};
ListLogLogPlot[τCurves, PlotStyle → {Magenta, Black, Red, Green, Blue},
点集的双对数图              绘图样式        品红色  黑色  红色 绿色  蓝色
 PlotLegends → {"τ=3", "τ=6", "τ=9", "τ=12", "τ=15"},
 绘图的图例
 PlotRange → PR, Joined → True, PlotLabel → "E0=-1.2"]
 绘制范围          连接点    真    绘图标签
```

Out[ ]=



Gaussian-Power as a filter

```
In[ ]:= funGassianPower[k_, τ_, xList_, htot_, d_] := Module[{x, yList, costList},
                                                        模块
          costList = funCost[htot, τ, d];
          yList = 0 * xList;
          Do[
          Do循环
           x = xList[[i]];
           If[k == 1,
           如果
            yList[[i]] = Exp[-x^2 τ^2 / 2] / costList[[k]];
                         指数形式
            , yList[[i]] = Abs[x^(k - 1) * Exp[-x^2 τ^2 / 2]] / costList[[k]]
                           绝对值          指数形式
            (*(((k-1)/(E τ^2))^((k-1)/2))*)
                          自然常数
           ]
           , {i, 1, Length[xList]}];
                    长度
          yList]

In[ ]:= τ = 5;
        xList = Table[i, {i, -1, 1, 0.005}];
                表格
```

In[ ]:=
```
ListPlot[{Transpose[{xList, funGassianPower[1, τ, xList, htot, d]}],
 Transpose[{xList, funGassianPower[2, τ, xList, htot, d]}],
 Transpose[{xList, funGassianPower[3, τ, xList, htot, d]}],
 Transpose[{xList, funGassianPower[4, τ, xList, htot, d]}],
 Transpose[{xList, funGassianPower[5, τ, xList, htot, d]}]},
(*GridLines→{{Sqrt[k-1]/τ},{((k-1)/(E τ^2))^((k-1)/2)}},*)
PlotRange → {{-1, 1}, {0, 1}},
PlotStyle → {{Thickness[0.004], Black}, {Thickness[0.004], Red},
  {Thickness[0.004], Green}, {Thickness[0.004], Orange}, {Thickness[0.004], Blue}},
Joined → True, Frame → True, FrameStyle → Directive[Black, Thickness[0.002]],
FrameTicksStyle → Directive[Black, Thickness[0.002]], FrameLabel → {"x", "|f_k'(x)|"},
PlotLegends → Placed[LineLegend[{"k=1", "k=2", "k=3", "k=4", "k=5"},
   LegendFunction → (Framed[#, FrameStyle → LightGray] &), LegendMarkerSize → {16, 8},
   LabelStyle → {Black, Bold, FontSize → 12, FontFamily → "Times New Roman"},
   LegendMargins → 0, LegendLayout → {"Column", 1}], {0.9, 0.7}],
LabelStyle → {FontSize → 15, FontFamily → "Arial"}, ImageSize → 380]
```

Out[ ]=