```
SetDirectory[NotebookDirectory[]];
<<tuxingbujian3dfunction.m;
<<tuxingbujian2dfunction.m;
<<zuhe.m;


Manipulate[(Framed[Graphics3D[
      If[t == 0 || t ==
         finaltime[ky, kL, kh, If[flag, ks, 100 Sqrt[(kL/100)^2 - ((kL/100) - (kh/100))^2]]],
       {process3D[ky, kx, kL, kh, If[flag, ks,
          100 Sqrt[(kL/100)^2 - ((kL/100) - (kh/100))^2]]],
        processBall[ky, kx, kL, kh, If[flag, ks,
          100 Sqrt[(kL/100)^2 - ((kL/100) - (kh/100))^2]],
         km1, km2, e, ΔEf, g, t], {GrayLevel[0.7], EdgeForm[],
         Polygon[{{-20, -40, -0.6}, {20, -40, -0.6}, {20, 40, -0.6}, {-20, 40, -0.6}}],
         Polygon[{{-20, -40, -1}, {-20, 40, -1}, {-20, 40, 50}, {-20, -40, 50}}],
         Polygon[{{-20, 40, -1}, {20, 40, -1}, {20, 40, 50}, {-20, 40, 50}}]}},
       {process2D[ky, kL, kh, If[flag, ks, 100 Sqrt[(kL/100)^2 - ((kL/100) - (kh/100))^2]]],
        processBall[ky, kx, kL, kh,
         If[flag, ks, 100 Sqrt[(kL/100)^2 - ((kL/100) - (kh/100))^2]],
         km1, km2, e, ΔEf, g, t]}], SphericalRegion → True,
     ViewPoint → {b Sin[α] Cos[β], b Sin[α] Sin[β], b Cos[α]}, ImageSize → size,
     Boxed → False, Lighting → "Neutral",
     PlotRange → {{-20, 20}, {-40, 40}, {-1, 50}}]]),
  (*Titel*)
  Item[Style["计算机全真模拟下的对碰撞打把能量损失的近一步研究 ", {25, Red, Bold}],
   ControlPlacement → Top],
  Item[" ", ControlPlacement → Top],
  (*Title*)
  Delimiter,
  (*1111111111111111111111111*)
  Item[Style["介绍与相关程序", {Blue, 15}], ControlPlacement → Left],
  Item[" ", ControlPlacement → Left],
  Item[
   Row[{PopupWindow[Button["实验原理"], "实验原理"],
     PopupWindow[Button["操作方法"], "操作方法"],
     Button["恢复系数e测量数据处理",
      CreateDialog[
       {FrontEndExecute[FrontEndToken["ToggleDynamicUpdating"]], processe},
       Enabled → True, WindowTitle → "恢复系数e测量数据处理", WindowFloating → True] ]},
    Spacer[4]],
   ControlPlacement → Left],
  (*11111111111111111111111111*)Delimiter,
  (*22222222222222222222222222*)
  Item[Style["图像调整", {Blue, 15}], ControlPlacement → Left],
```

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Item[Column[{" ",
   Control[
    {{b, 1.5, "观察距离"}, Manipulator[#, {0, 2}, AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}],
   Control[{{β, -π / 6, "水平旋转"}, Manipulator[#, {-π, π},
       AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}],
   Control[{{α, π / 3, "改变俯角"}, Manipulator[#, {0, π / 2},
       AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}],
   Control[{{size, 600, "放大缩小"}, Manipulator[#, {300, 2000},
        AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}]
  }], ControlPlacement → Left],
(*22222222222222222222222222*)
Delimiter,
(*33333333333333333333333333*)
Item[Style["碰撞小球及实验台的性质", {Blue, 15}], ControlPlacement → Left],
Item[Column[
  {" ", Control[{{km1, 32.77, "撞击球的\n质量m1"}, Manipulator[#, {10, 50},
       AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}],
   Control[{{km2, 32.62, "被撞球的\n质量m2"}, Manipulator[#,
       {10, 50}, AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}],
   Control[{{e, 0.94, "恢复系数"},
     Manipulator[#, {0, 1}, AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}],
   Control[{{ky, 15.70, "球柱高度"},
     Manipulator[#, {10, 20}, AppearanceElements → {"InputField"},
       ImageSize → Medium, Appearance → "Labeled"] &}]}], ControlPlacement → Left],
(*33333333333333333333333333333*)
(*44444444444444444444444444444*)
Delimiter,
Item[Style["实验调节", {Blue, 15}], ControlPlacement → Left],
Item[" ", ControlPlacement → Left],
Item[Button[Style["实验调节控制面板", {Red, 15}], CreateDialog[
   Grid[{{Control[{{kL, 25.00, "摆线长L  "}, Manipulator[#, {5, 46 - ky - 1},
         AppearanceElements → {"InputField"},
         ImageSize → Medium, Appearance → "Labeled"] &}],
      Row[{"  ", Checkbox[Dynamic[flag]], Style[" 考虑摆线弯曲", Orange]}]},
     {Control[{{kx, 21.00, "靶心位置x"}, Manipulator[#, {6, 24, 1},
         AppearanceElements → {"InputField"},
         ImageSize → Medium, Appearance → "Labeled"] &}],
      Dynamic[StringForm["  理论值h0=``cm", NumberForm[
          N[(km1 + km2)^2 kx^2 / (16 km1^2 ky)], {4, 2}]]]},
     {Row[{Control[{{ΔEf, 0.0005, "固有损失Δε0  "}, InputField[#, FieldSize → 14] &}],
        "  J"}],
```

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      Dynamic[StringForm["  修正值Δh=``cm",
        NumberForm[N[
          100 (-g km2 (16 (1 + e)^2 kL^3 km1^2 ky - 16 (1 + e)^2 kL km1^2 If[flag, ks,
                  100 √((kL/100)^2 - ((kL/100) - (kh/100))^2)]^2
              ky + (1 + e)^2 If[flag, ks,
                  100 √((kL/100)^2 - ((kL/100) - (kh/100))^2)]^2
              (2 km1 km2 kx^2 + km2^2 kx^2 + km1^2 (kx^2 +
                  16 √(kL^2 - If[flag, ks, 100 √((kL/100)^2 -
                      ((kL/100) - (kh/100))^2)]^2) ky)) -
            4 kL^2 (2 km1 km2 kx^2 + km2^2 kx^2 + km1^2 (kx^2 + 4 (1 + e)^2
                  √(kL^2 - If[flag, ks,
                      100 √((kL/100)^2 - ((kL/100) - (kh/100))^2)]^2)
                  ky))) +
            1600000 kL^2 (km1 + km2)^2 ky ΔEf) / (1600 (1 + e)^2 g km1^2 km2 If[flag, ks,
            100 √((kL/100)^2 - ((kL/100) - (kh/100))^2)]^2 ky)], {4, 2}]]},
      {Control[{{kh, 7.02, "起落高度h"}, Manipulator[#, {2, 20},
          AppearanceElements → {"InputField"},
          ImageSize → Medium, Appearance → "Labeled"] &}],
       Dynamic[StringForm["      h-h0=``cm", NumberForm[N[
          -(2 km1 km2 kx^2 + km2^2 kx^2 + km1^2 (kx^2 - 16 kh ky))/(16 km1^2 ky)], {4, 2}]]]},
      {Dynamic[Row[{Style["水平距离s ", If[flag, Black, GrayLevel[0.5]]]
          , Manipulator[Dynamic[ks], {5, 100 √((kL/100)^2 - ((kL/100) - (kh/100))^2)},
          AppearanceElements → {"InputField"},
          ImageSize → Medium, Appearance → "Labeled",
          Enabled → flag]}]],
       Dynamic[Style[StringForm["  "弯曲偏移Δs=``cm"      ,
          NumberForm[N[100 √((kL/100)^2 - ((kL/100) - (kh/100))^2) - ks], {4, 2}]
          ], If[flag, Black, GrayLevel[0.5]]]]},
      Frame → All, FrameStyle → GrayLevel[0.8],
      Alignment → Left]
     , WindowFrame → "Palette", WindowFloating → True, WindowTitle → "实验调节控制面板"],
   ImageSize → {253, 25}], ControlPlacement → Left],
(*4444444444444444444444444444444*)
Delimiter,
Item[Style["模拟", {Blue, 15}], ControlPlacement → Left],
Item[" ", ControlPlacement → Left],
Item[Framed[Grid[{{" "},
    {Style["开始模拟", {15, Bold}]    ,   Style["速率", {15, Bold}]},
    {Control[{{t, 0, ""}, Trigger[#, {0, finaltime[ky, kL, kh, If[flag, ks,
```

```
            100 Sqrt[(kL / 100)^2 - ((kL / 100) - (kh / 100))^2] ]]},
          ups, ImageSize → Large] &}],
       Control[{{ups, 0.1, ""}, InputField[#, FieldSize → 3,
          Background → GrayLevel[0.9]] &}],
       "  ", Button[Style["输出报告", {Red, 15}], If[t == finaltime[ky, kL, kh,
          If[flag, ks, 100 Sqrt[(kL / 100)^2 - ((kL / 100) - (kh / 100))^2] ]],
        CreateDialog[Panel[

          Style[
           StringForm["被撞球打靶位置模拟结果：`1` cm", NumberForm[finalx, {4, 2}]],
           {Red, 20}], Background → White], WindowFloating → True,
         WindowTitle → "实验报告"]],
       ImageSize → {80, 30}]}], Background → GrayLevel[0.8]]],
  ControlPlacement → Left],
 Initialization :→ (g = 9.796; flag = True; ks = 15;), SaveDefinitions → True
] // Framed
```

计算机全真模拟下的对碰撞打把能量损失的近一步研究

介绍与相关程序

实验原理 | 操作方法 | 恢复系数 e 测量数据处理

图像调整

观察距离 1.5

水平旋转 $-\frac{\pi}{6}$

改变俯角 $\frac{\pi}{3}$

放大缩小 600

碰撞小球及实验台的性质

撞击球的质量 m_1 32.7

被撞球的质量 m_2 32.6

恢复系数 0.94

球柱高度 15.7

实验调节

实验调节控制面板

模拟

开始模拟 速率

▶ || ⏮ 0.1 输出报告