

In[209]:=

```
SetDirectory[NotebookDirectory[]];
```

In[210]:=

```
htm = 41.471086850534505; (* MeV fm2 *)
```

## Blatt Biedermann parametrization

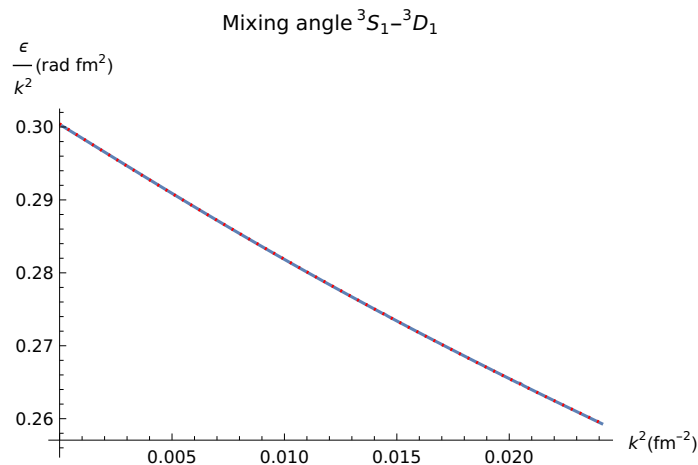
In[211]:=

```
DT = Import["output/AV18/delta_BB_3S1-3D1.dat", "Table"];
DT[[All, 1]] /= htm; (* E → k2 (fm-2) *)
DT[[All, 2]] = Cot[DT[[All, 2]]  $\frac{\pi}{180}$ ] DT[[All, 1]]1/2; (* δ0 → k Cotδ0 (fm-1) *)
DT[[All, 3]] = Cot[DT[[All, 3]]  $\frac{\pi}{180}$ ] DT[[All, 1]]5/2; (* δ2 → k5 Cotδ2 (fm-5) *)
DT[[All, 4]] /= DT[[All, 1]]  $\frac{180}{\pi}$ ; (* ε → ε/k2 (rad fm2) *)
f[k2] = Fit[DT[[All, {1, 4}]], {1, k2, k22}, k2]
Show[
  ListPlot[DT[[All, {1, 4}]], Joined → True, PlotRange → All,
    AxesLabel → {"k2(fm-2)", "  $\frac{\epsilon}{k^2}$  (rad fm2)"}, PlotLabel → "Mixing angle 3S1-3D1"],
  Plot[f[x], {x, 0, DT[[-1, 1]]}, PlotStyle → {Dotted, Red}]
]
```

Out[216]=

```
0.300436 - 1.9664 k2 + 10.924 k22
```

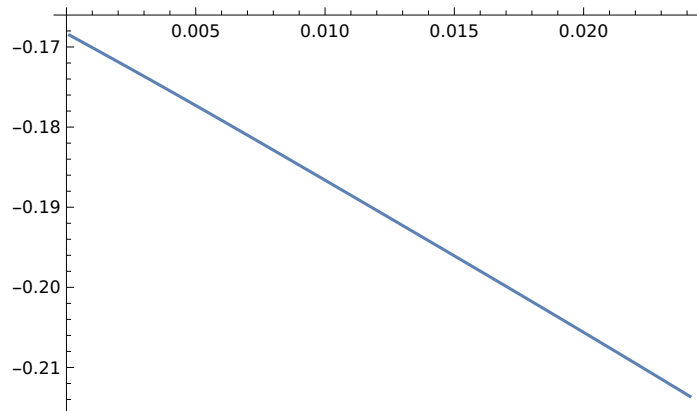
Out[217]=



In[218]:=

```
ListPlot[DT[All, {1, 3}], Joined → True]  
Fit[DT[All, {1, 3}], {1, x, x2}, x]
```

Out[218]=



Out[219]=

$$-0.16822 - 1.80972 x - 3.03049 x^2$$

In[220]:=

```

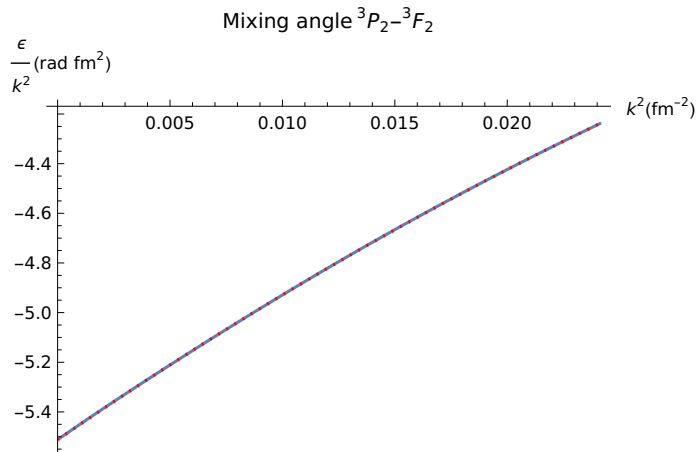
DT = Import["output/AV18/delta_BB_3P2-3F2.dat", "Table"];
(* Table E (MeV) - ε (deg) *)
DT[[All, 1]] /= htm; (* E → k2 (fm-2) *)
DT[[All, 2]] = Cot[DT[[All, 2]]  $\frac{\pi}{180}$ ] DT[[All, 1]]3/2; (* δ1 → k3 Cotδ1 (fm-3) *)
DT[[All, 3]] = Cot[DT[[All, 3]]  $\frac{\pi}{180}$ ] DT[[All, 1]]7/2; (* δ3 → k7 Cotδ3 (fm-7) *)
DT[[All, 4]] /= DT[[All, 1]]  $\frac{180}{\pi}$ ; (* ε → ε/k2 (rad fm2) *)
f[k2_] = Fit[DT[[All, {1, 4}]], {1, k2, k22}, k2]
Show[
  ListPlot[DT[[All, {1, 4}]], Joined → True, PlotRange → All,
    AxesLabel → {"k2(fm-2)", "  $\frac{\epsilon}{k^2}$ (rad fm2)"}, PlotLabel → "Mixing angle 3P2-3F2"],
  Plot[f[x], {x, 0, DT[[1, 1]]}, PlotStyle → {Dotted, Red}]
]

```

Out[225]=

-5.51199 + 62.2425 k2 - 391.314 k2<sup>2</sup>

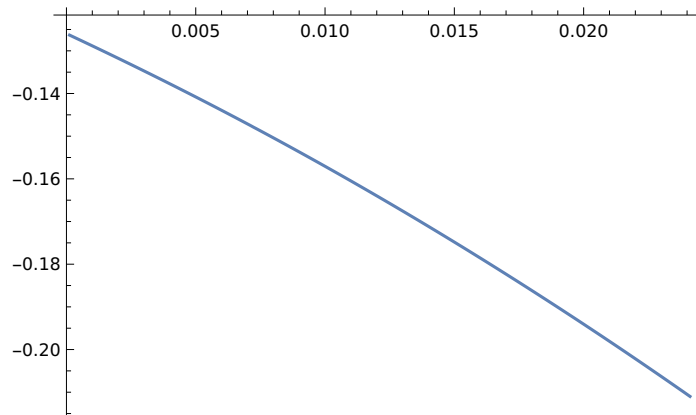
Out[226]=



In[227]:=

```
ListPlot[DT[All, {1, 3}], Joined → True]  
Fit[DT[All, {1, 3}], {1, x, x^2}, x]
```

Out[227]=



Out[228]=

$$-0.126009 - 2.8096 x - 29.6313 x^2$$

# Stapp parametrization

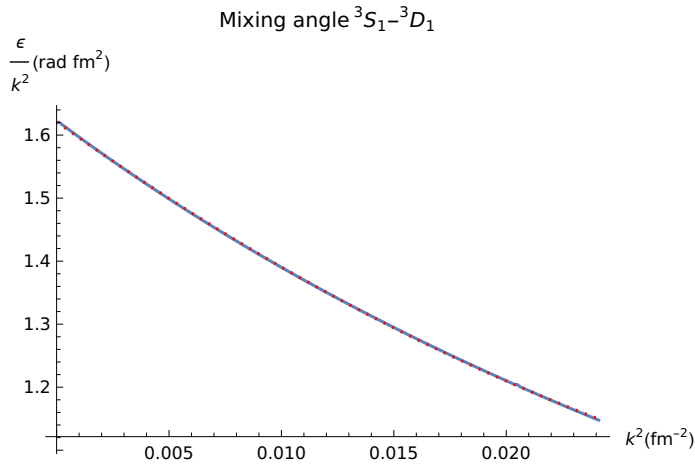
In[229]:=

```
DT = Import["output/AV18/delta_3S1-3D1.dat", "Table"];
DT[[All, 1]] /= htm; (* E → k2 (fm-2) *)
DT[[All, 2]] = Cot[DT[[All, 2]]  $\frac{\pi}{180}$ ] DT[[All, 1]]1/2; (* δ0 → k Cotδ0 (fm-1) *)
DT[[All, 3]] = Cot[DT[[All, 3]]  $\frac{\pi}{180}$ ] DT[[All, 1]]5/2; (* δ2 → k5 Cotδ2 (fm-5) *)
DT[[All, 4]] /= DT[[All, 1]]3/2  $\frac{180}{\pi}$ ; (* ε → ε/k3 (rad fm3) *)
f[k2_] = Fit[DT[[All, {1, 4}]], {1, k2, k22}, k2]
Show[
  ListPlot[DT[[All, {1, 4}]], Joined → True, PlotRange → All,
    AxesLabel → {"k2(fm-2)", "  $\frac{\epsilon}{k^2}$ (rad fm2)"}, PlotLabel → "Mixing angle 3S1-3D1"],
  Plot[f[x], {x, 0, DT[[1, 1]]}, PlotStyle → {Dotted, Red}]
]
```

Out[234]=

1.62084 - 25.4891 k2 + 246.848 k2<sup>2</sup>

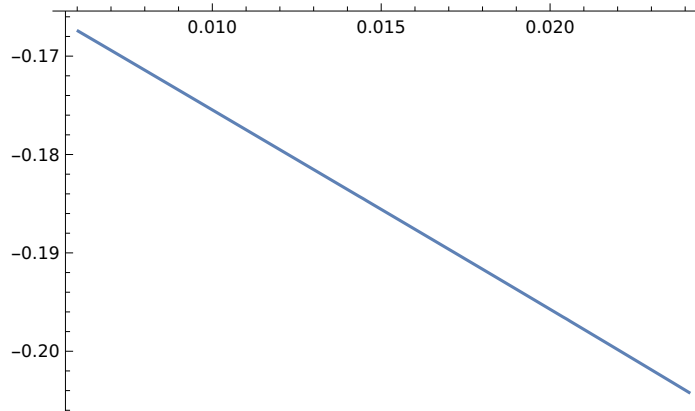
Out[235]=



In[236]:=

```
ListPlot[DT[[50 ;;, {1, 3}]], Joined → True]  
Fit[DT[[50 ;;, {1, 3}]], {1, x, x2}, x]
```

Out[236]=



Out[237]=

$$-0.155404 - 1.99381 x - 1.16322 x^2$$

In[238]:=

```

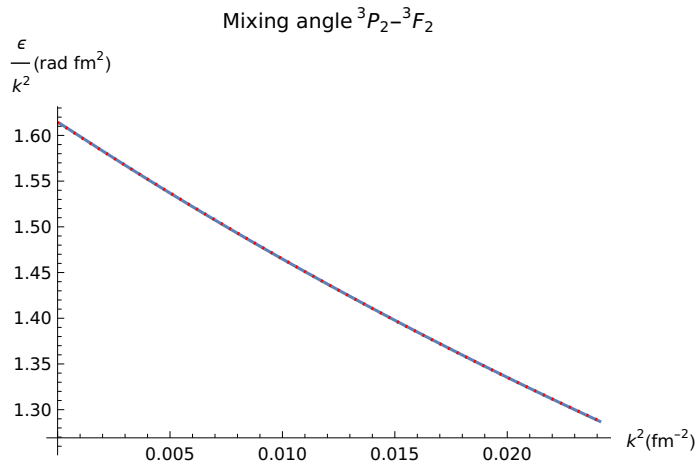
DT = Import["output/AV18/delta_3P2-3F2.dat", "Table"];
(* Table E (MeV) - ε (deg) *)
DT[[All, 1]] /= htm; (* E → k2 (fm-2) *)
DT[[All, 4]] /= DT[[All, 1]]5/2  $\frac{180}{\pi}$ ; (* ε → ε/k5 (rad fm5) *)
DT[[All, 2]] = Cot[DT[[All, 2]]  $\frac{\pi}{180}$ ] DT[[All, 1]]3/2; (* δ1 → k3 Cotδ1 (fm-3) *)
DT[[All, 3]] = Cot[DT[[All, 3]]  $\frac{\pi}{180}$ ] DT[[All, 1]]7/2; (* δ3 → k7 Cotδ3 (fm-7) *)
f[k2_] = Fit[DT[[All, {1, 4}]], {1, k2, k22}, k2]
Show[
  ListPlot[DT[[All, {1, 4}]], Joined → True, PlotRange → All,
    AxesLabel → {"k2(fm-2)", " $\frac{\epsilon}{k^2}$ (rad fm2)"}, PlotLabel → "Mixing angle 3P2-3F2"],
  Plot[f[x], {x, 0, DT[[All, 1]]}, PlotStyle → {Dotted, Red}]
]

```

Out[243]=

1.61436 - 15.9354 k2 + 98.9888 k2<sup>2</sup>

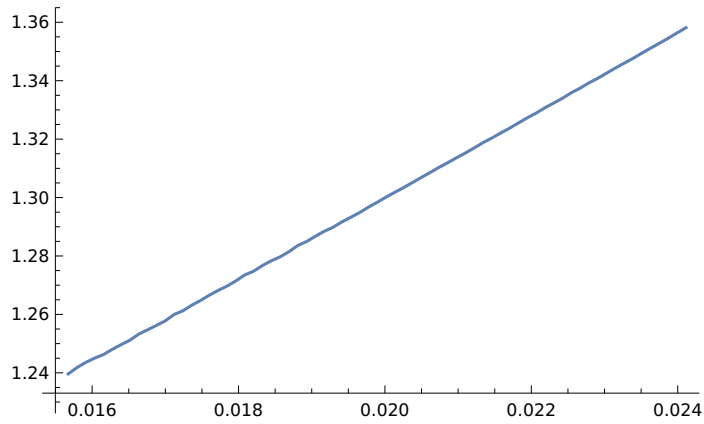
Out[244]=



In[245]:=

```
ListPlot[DT[[130 ;;, {1, 3}]], Joined → True]  
Fit[DT[[130 ;;, {1, 3}]], {1, x, x2}, x]
```

Out[245]=



Out[246]=

$1.03225 + 12.7522 x + 31.4676 x^2$

In[247]:=

```
SetOptions[SelectedNotebook[],  
  PrintingStyleEnvironment → "Printout", ShowSyntaxStyles → True]  
NotebookPrint[EvaluationNotebook[], "mixing_angle_fit.pdf"]
```