In[1]:=
```
<< c:\\femm42\\mathfemm\\mathfemm.m
```
```
MathFEMM loaded at Wed 15 Jun 2016 12:35:01
```

In[2]:=
```
OpenFEMM[]
```

In[3]:=
```
OpenDocument[NotebookDirectory[] <> "zhu.fem"]
```

In[4]:=
```
(* Analyze once at nominal load point *)
```

In[5]:=
```
Ia = 4;
β = 0;
θ = 0;
MISetCurrent["A", Ia * Cos[β]];
MISetCurrent["B", Ia * Cos[β + 120 * Degree]];
MISetCurrent["C", Ia * Cos[β - 120 * Degree]];
MIAnalyze[]
```

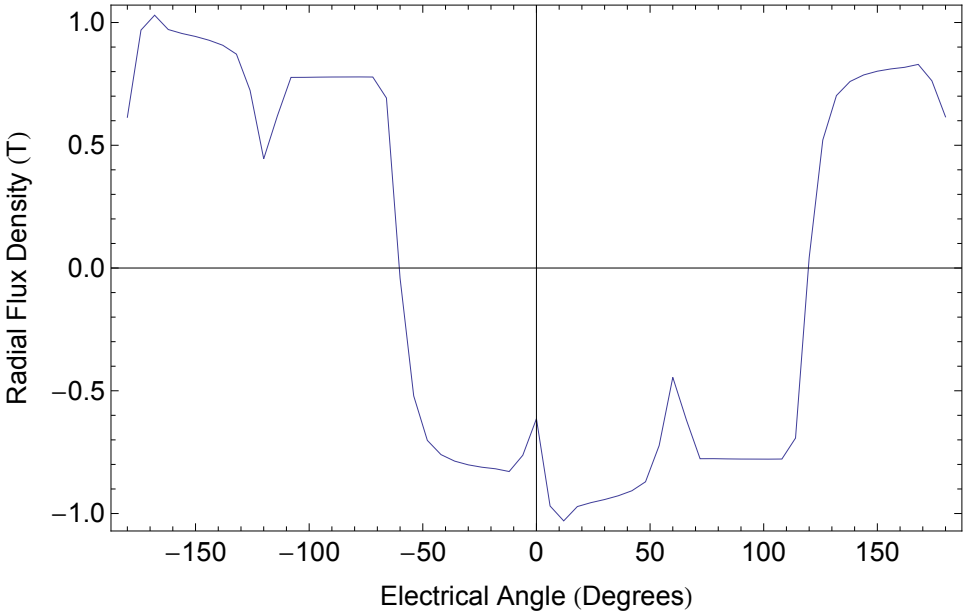
In[12]:=
```
MILoadSolution[]
```

In[13]:=
```
Rgap = 31 - 0.75 / 2;
p = 3;
BnWhole = {};
BtWhole = {};
For[k = -60, k ≤ 60, k += 2,
  n = {Cos[k * Degree], Sin[k * Degree]};
  t = {-Sin[k * Degree], Cos[k * Degree]};
  B = MOGetB[Rgap * n[[1]], Rgap * n[[2]]];
  BnWhole = Append[BnWhole, {p * k, B.n}];
  BtWhole = Append[BnWhole, {p * k, B.t}];
 ];
```

In[18]:=
```
MOClose[];
```

In[19]:=
```
ListPlot[BnWhole, Joined → True, Frame → True,
 ImageSize → 500, BaseStyle → {FontFamily → "Arial", FontSize → 14},
 FrameLabel → {"Electrical Angle (Degrees)", "Radial Flux Density (T)"}]
```

Out[19]=



In[20]:=
```
MISaveAs[NotebookDirectory[] <> "pZhu.fem"];
```

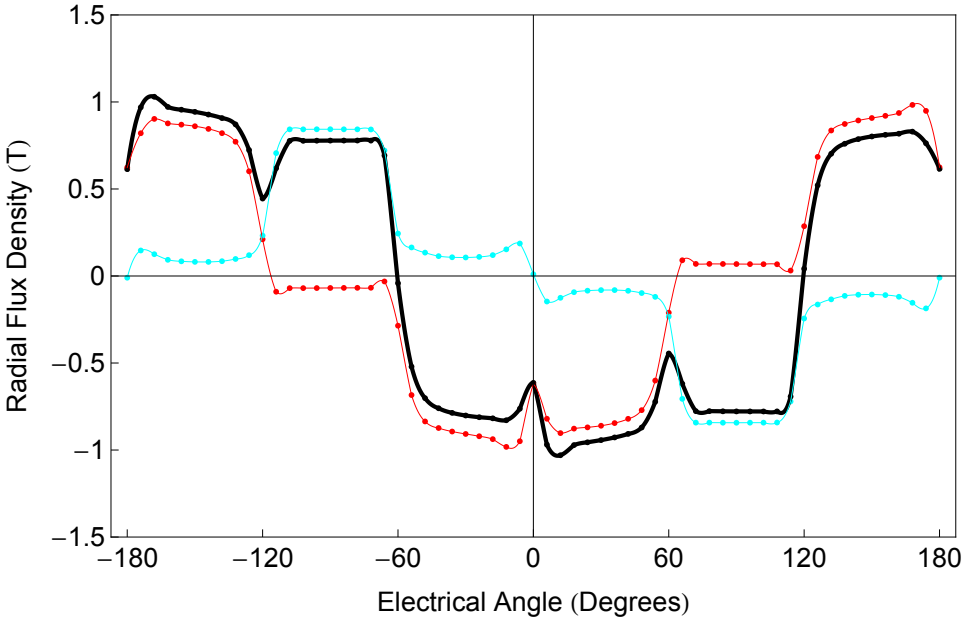
In[21]:=
```
MISetPrevious["zhu.ans", 2];
```

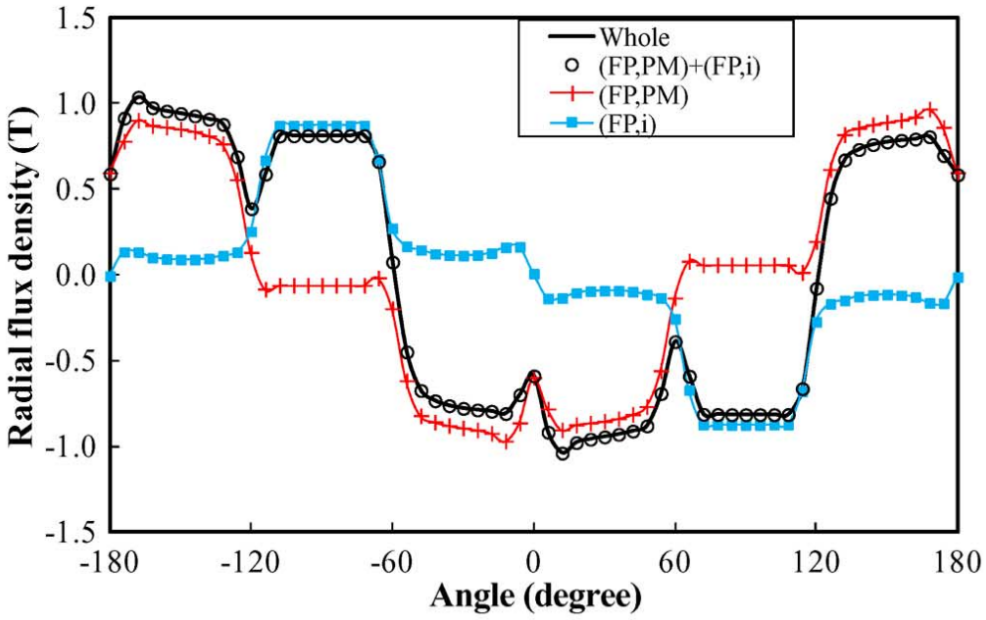
In[22]:=
```
(* Magnet Only *)
Ia = 0;
MISetCurrent["A", Ia * Cos[β]];
MISetCurrent["B", Ia * Cos[β + 120 * Degree]];
MISetCurrent["C", Ia * Cos[β - 120 * Degree]];
MIModifyMaterial["NdFeB", 3, 891 000];
MIAnalyze[];
MILoadSolution[];
BnPM = {};
BtPM = {};
For[k = -60, k ≤ 60, k += 2,
  n = {Cos[k * Degree], Sin[k * Degree]};
  t = {-Sin[k * Degree], Cos[k * Degree]};
  B = MOGetB[Rgap * n[[1]], Rgap * n[[2]]];
  BnPM = Append[BnPM, {p * k, B.n}];
  BtPM = Append[BnPM, {p * k, B.t}];
 ];
MOClose[];
```

In[33]:=
```
(* Current Only *)
Ia = 4;
MISetCurrent["A", Ia * Cos[β]];
MISetCurrent["B", Ia * Cos[β + 120 * Degree]];
MISetCurrent["C", Ia * Cos[β - 120 * Degree]];
MIModifyMaterial["NdFeB", 3, 0];
MIAnalyze[];
MILoadSolution[];
BnI = {};
BtI = {};
For[k = -60, k ≤ 60, k += 2,
  n = {Cos[k * Degree], Sin[k * Degree]};
  t = {-Sin[k * Degree], Cos[k * Degree]};
  B = MOGetB[Rgap * n[[1]], Rgap * n[[2]]];
  BnI = Append[BnI, {p * k, B.n}];
  BtI = Append[BnI, {p * k, B.t}];
 ];
MOClose[];
```

In[44]:=
```
Show[ListPlot[{BnWhole, BnPM, BnI}, Joined → False, Frame → True,
  ImageSize → 500, BaseStyle → {FontFamily → "Arial", FontSize → 14},
  FrameLabel → {"Electrical Angle (Degrees)", "Radial Flux Density (T)"},
  PlotRange → {-1.5, 1.5},
  PlotStyle → {{Black, Thickness[0.005]}, Red, Cyan}, FrameTicks →
   {{-180, -120, -60, 0, 60, 120, 180}, {-1.5, -1, -0.5, 0, 0.5, 1, 1.5}, None, None}],
 Plot[{Interpolation[BnWhole][x], Interpolation[BnPM][x], Interpolation[BnI][x]},
  {x, -180, 180}, Frame → True, ImageSize → 500,
  BaseStyle → {FontFamily → "Arial", FontSize → 14},
  FrameLabel → {"Electrical Angle (Degrees)", "Radial Flux Density (T)"},
  PlotRange → {-1.5, 1.5},
  PlotStyle → {{Black, Thickness[0.005]}, Red, Cyan}, FrameTicks →
   {{-180, -120, -60, 0, 60, 120, 180}, {-1.5, -1, -0.5, 0, 0.5, 1, 1.5}, None, None}]]
```

Out[44]=





In[45]:=
```
ListPlot[{(BnI + BnPM.{{0, 0}, {0, 1}}), BnWhole}, Joined → True]
```

Out[45]=