Status of Q2pF Return End Design

Ramesh Gupta

January 23, 2024
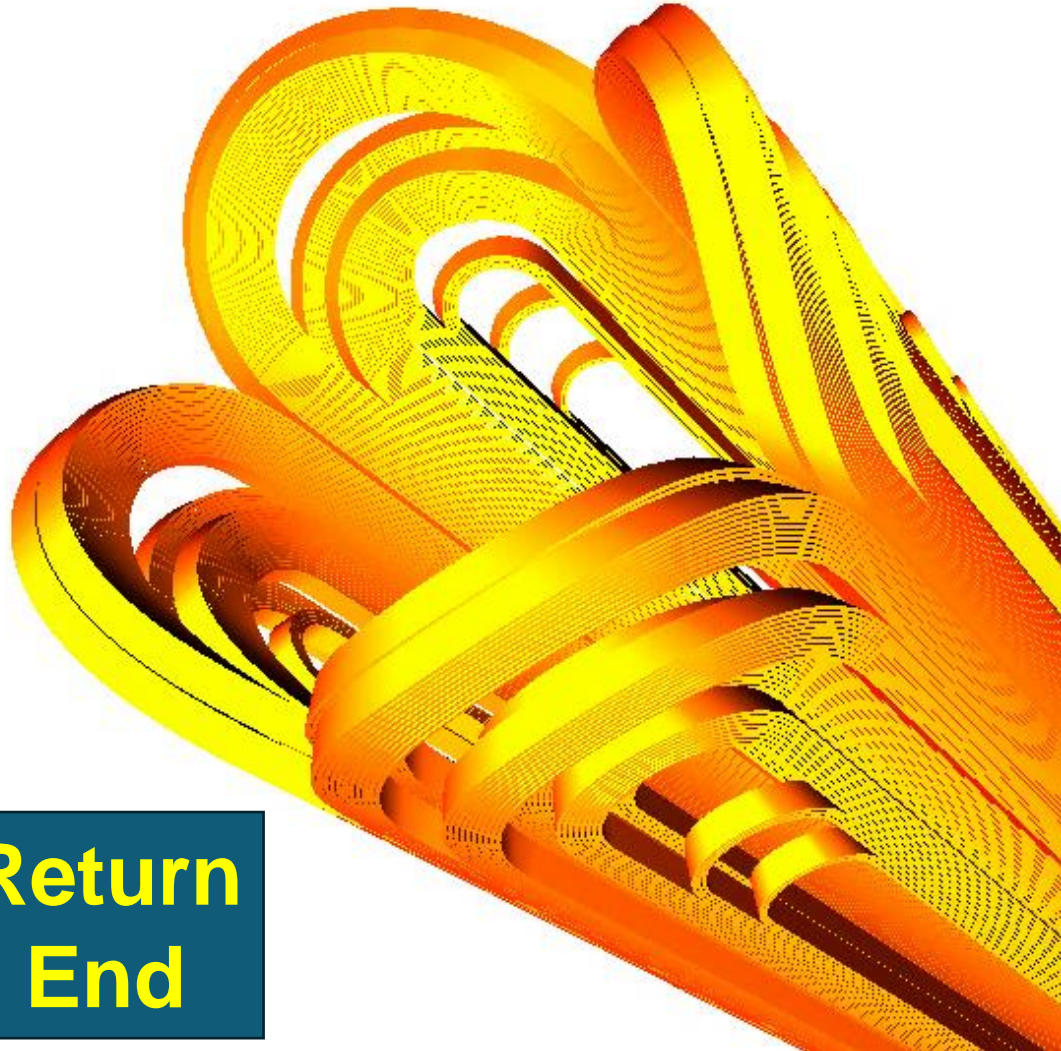
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Current Version (min tilt angle 70º)

➢ **Fewer spacer**
➢ **End turns of the outer and the inner layers aligned**

Magnet Division
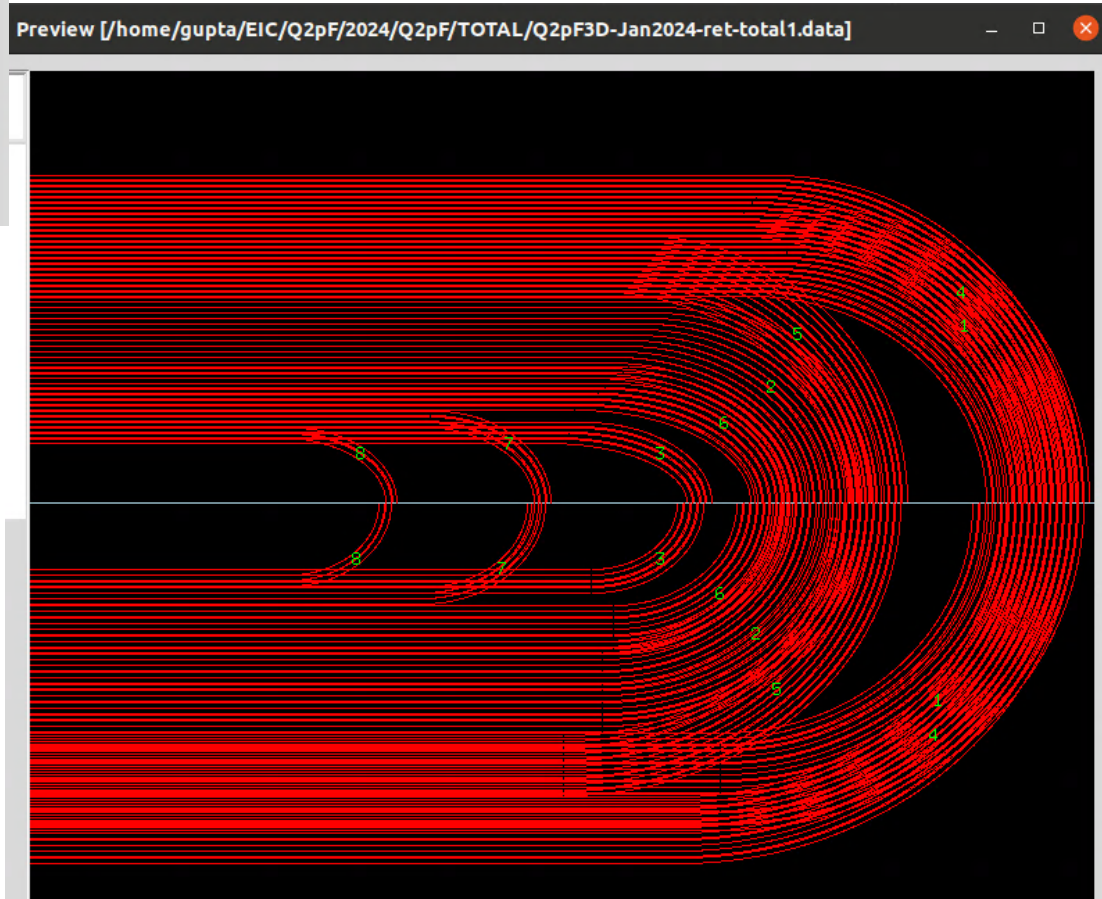
Inner and Outer Layers (both)
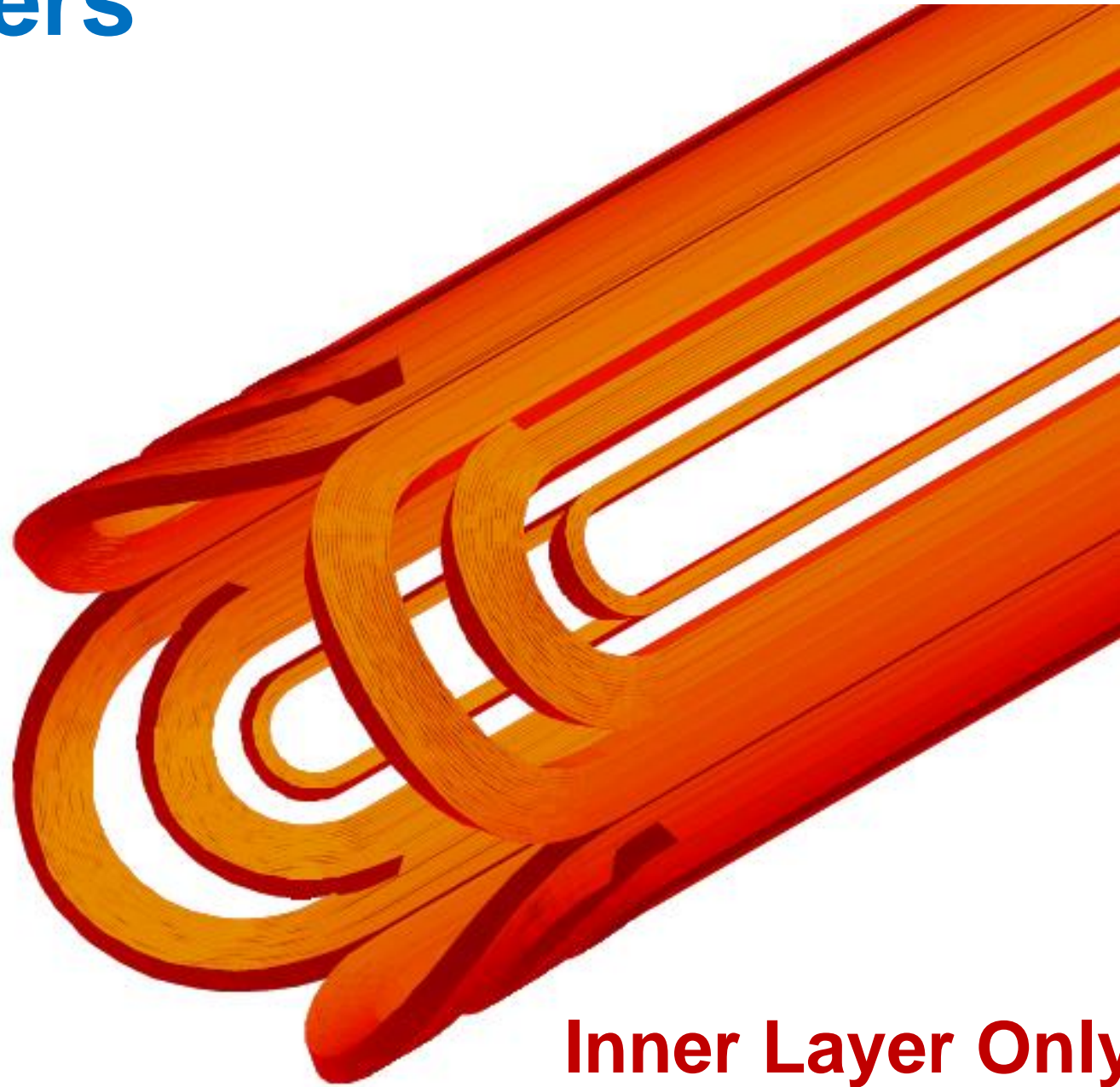
Return End

Inner Layer Only

Inner and Outer Layers (both)
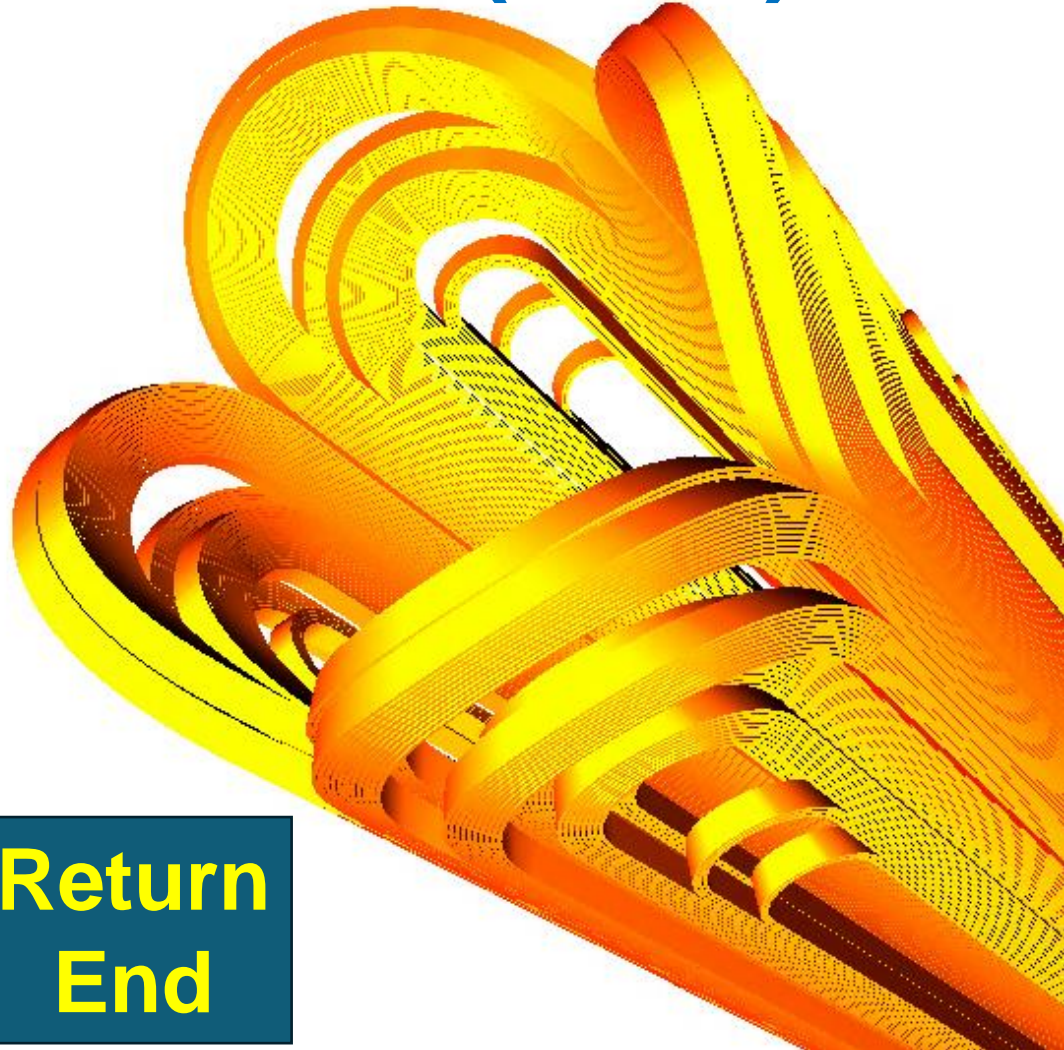
Return End

Outer Layer Only

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Peak field & harmonics


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HARMONIC ANALYSIS NUMBER ..........................        1
MAIN HARMONIC ..............................        2
REFERENCE RADIUS (mm) ..........................    83.0000
X-POSITION OF THE HARMONIC COIL (mm) ...............     0.0000
Y-POSITION OF THE HARMONIC COIL (mm) ...............     0.0000
NUMBER OF ANALYSES ALONG Z .......................      100
LENGTH OF VIRTUAL COIL (mm) ......................   200.0000
REFERENCE POSITION NUMBER ........................       10
MEASUREMENT TYPE ..................... ALL FIELD CONTRIBUTIONS
ERROR OF HARMONIC ANALYSIS OF Br ..................   0.6826E-04
SUM (Br(p) - SUM (An cos(np) + Bn sin(np))

3D REFERENCE MAIN FIELD (T) ......................    3.4386
REFERENCE MAGNET STRENGTH (T/(m^(n-1)) ............   41.4295
MAGNETIC LENGTH (mm) .............................   200.0006

NORMAL 3D INTEGRAL RELATIVE MULTIPOLES (1.D-4):
b 1:      0.00000   b 2:  10000.00000   b 3:      0.00000
b 4:     -0.00000   b 5:      0.00000   b 6:      0.13027
b 7:     -0.00000   b 8:      0.00000   b 9:     -0.00000
b10:     -0.40171   b11:      0.00000   b12:      0.00000
b13:     -0.00000   b14:     -0.43070   b15:     -0.00000
b16:     -0.00000   b17:      0.00000   b18:      0.00484
```

Body (SS)

Reasonable start:

- **Field harmonics (3-d): seems ok**

- **Peak field: 6.98 T (Vs 6.85 T in 2-d)**

Only about ~1.9% higher peak field than that in x-section

(calculation errors?)

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NUMBER OF ANALYSES ALONG Z ......................      100
LENGTH OF VIRTUAL COIL (mm) ......................  2500.0000
REFERENCE POSITION NUMBER ........................       10
MEASUREMENT TYPE ..................... ALL FIELD CONTRIBUTIONS
ERROR OF HARMONIC ANALYSIS OF Br ..................   0.5233E-04
SUM (Br(p) - SUM (An cos(np) + Bn sin(np))

3D REFERENCE MAIN FIELD (T) ......................    3.4387
REFERENCE MAGNET STRENGTH (T/(m^(n-1)) ............   41.4300
MAGNETIC LENGTH (mm) .............................  1726.1518

NORMAL 3D INTEGRAL RELATIVE MULTIPOLES (1.D-4):
b 1:     -0.00000   b 2:  10000.00000   b 3:     -0.00000
b 4:      0.00000   b 5:      0.00000   b 6:     -0.08770
b 7:     -0.00000   b 8:     -0.00000   b 9:     -0.00000
b10:     -0.63054   b11:      0.00000   b12:      0.00000
b13:      0.00000   b14:     -0.42979   b15:     -0.00000
b16:     -0.00000   b17:     -0.00000   b18:      0.00201
```

Integrated Harmonics (3-d)

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