Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

Inner Yoke Optimization of B1pF

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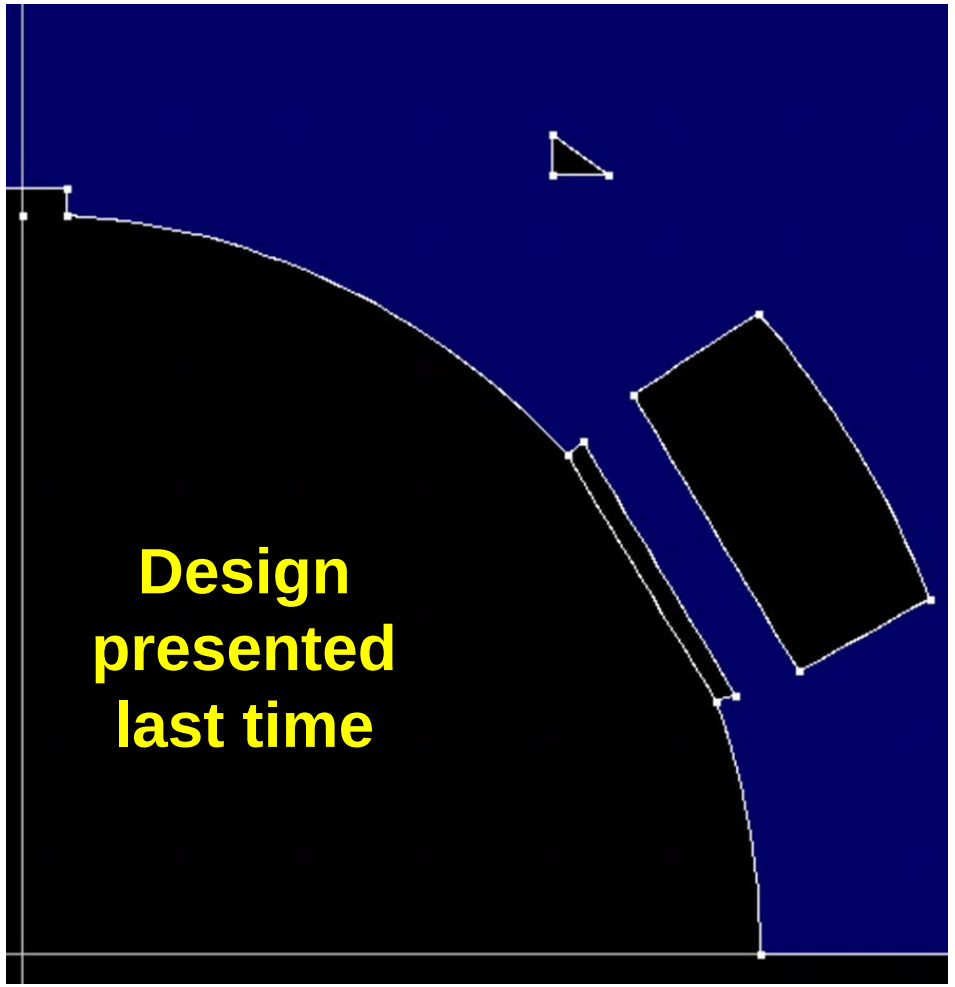
Further Tuning of Inner Yoke

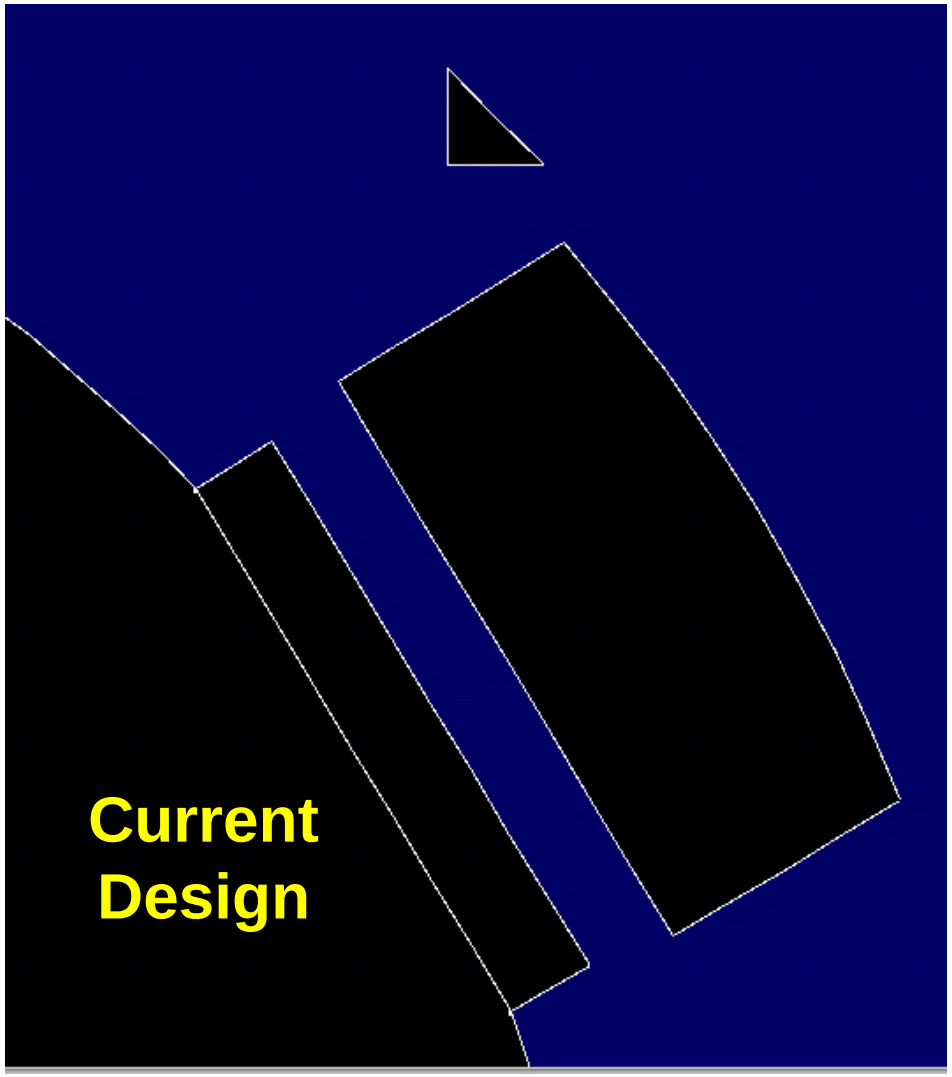
- Last presentation provided a basic solution for the inner and outer yokes which appear to satisfy both mechanical and magnetic requirements despite a limited space available due to small radial width of inner yoke.
- Initial design showed that sufficient space for tie rods can be provided with a good margin (significantly more than 21 square inch requested).
- Initial design also showed that low-field b_3 created by the key can be compensated by a cutout in the iron inner yoke at a strategic location.
- Current design incorporates more feedback from the mechanical design.
- Initial idea of tuning shim examined for geometric harmonics.
- Further extension of tuning shim concept is explored to tune b_3 current dependence (saturation-control), in addition to the geometric harmonics.

Feedback from the Mechanical Design Incorporated

- ❑ Current design is for placing a new larger iron od yoke over the current small iron od yoke.
- ❑ Alternatively, one could replace smaller inner od yoke after the first test by a larger od yoke.

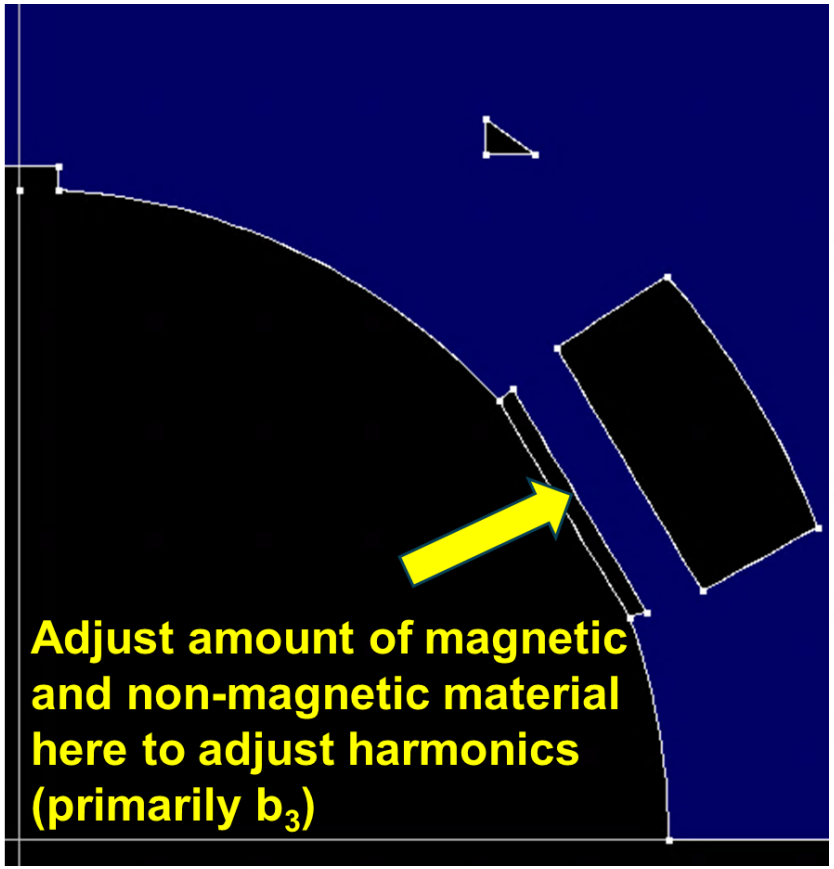
- ➢ Notch moved to 45 degrees, as requested
- ➢ ¼ inch web over cutout for bars, as requested
- ➢ Large notch at the pole can be accommodated

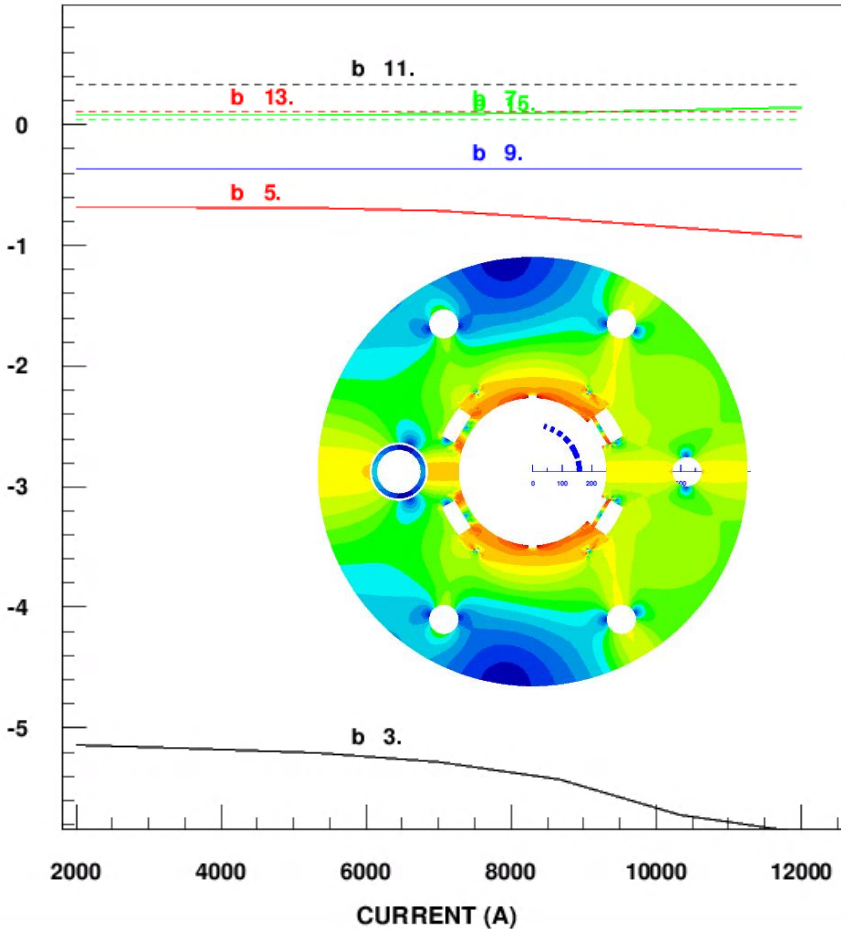


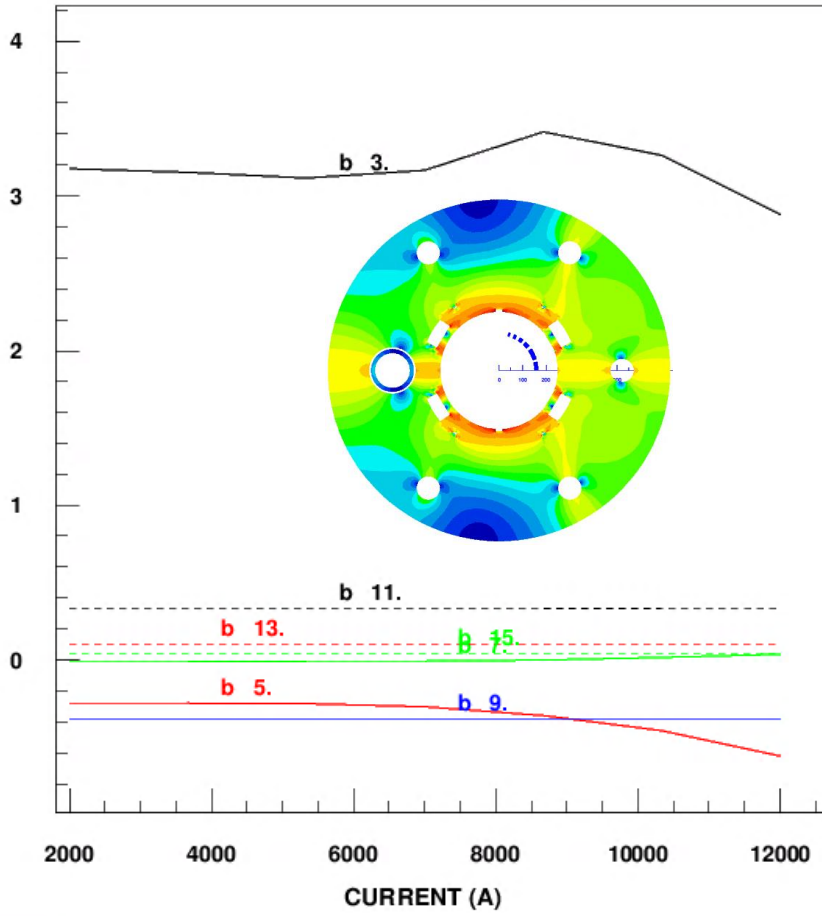


Tuning Field Harmonics after Construction - tuning shims (presented last time for geometric b_3)

- Significant b_3 tuning (from over 3 units to under -5 units (> 8 units)





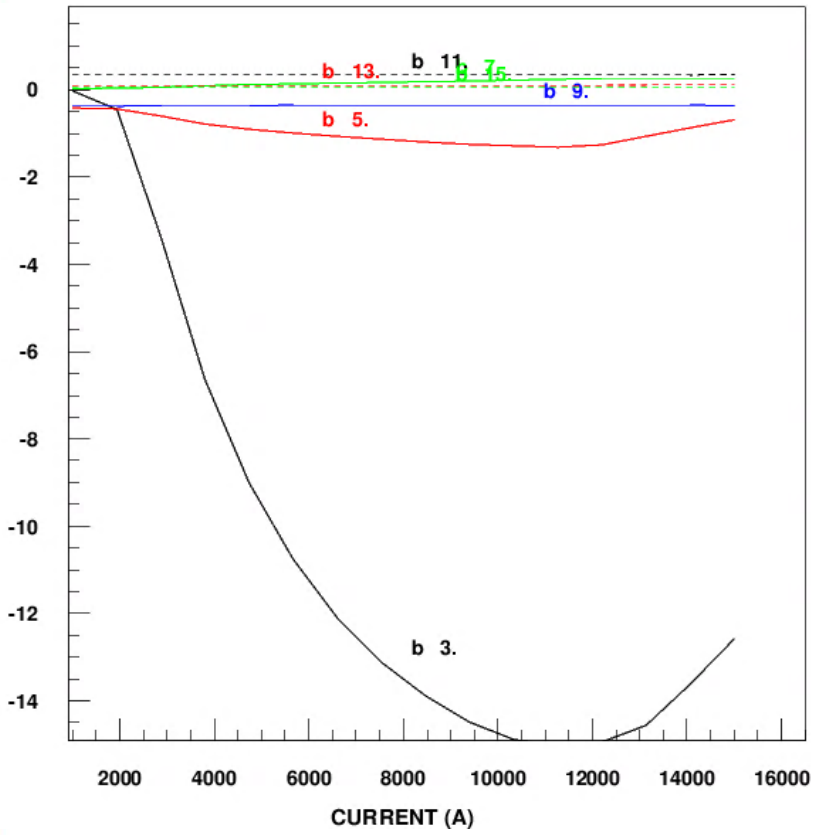


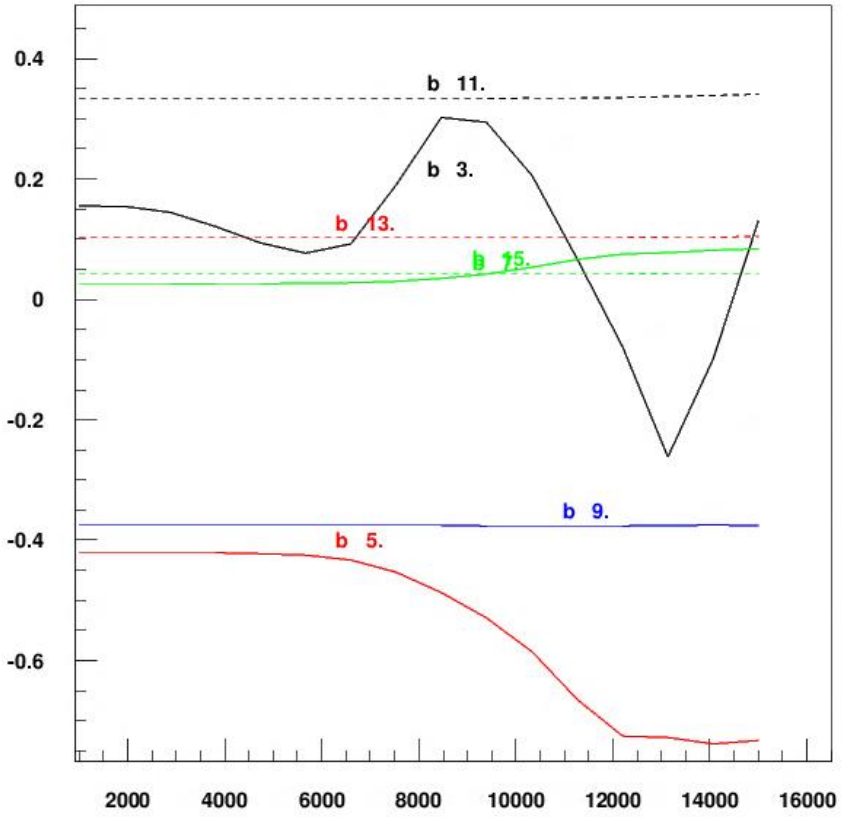
b_3 saturation - can be tuned after construction and measurements

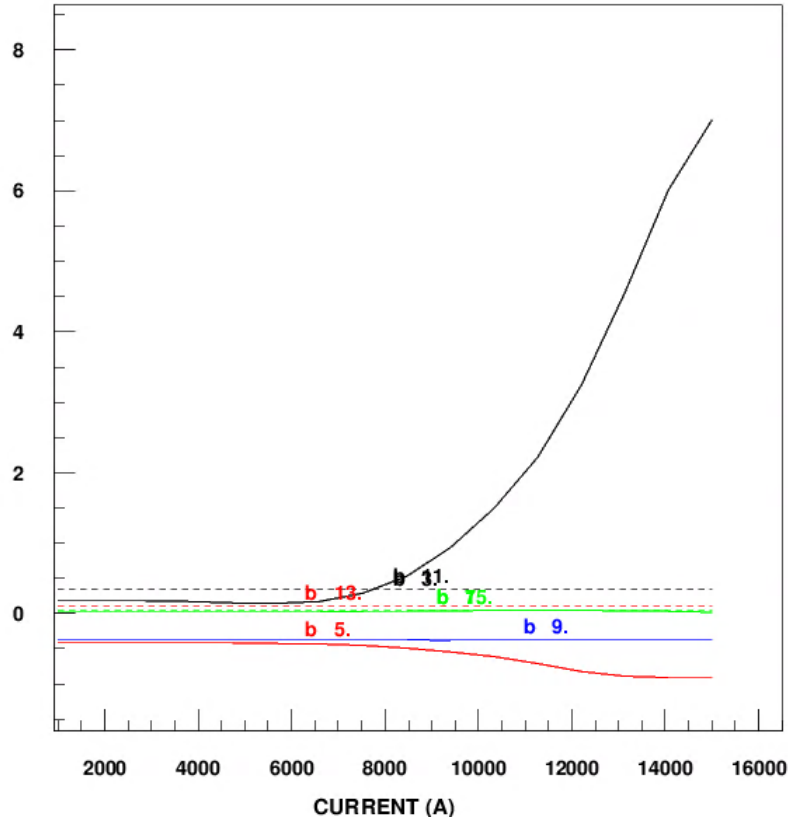
b3 saturation tuned on the negative side

Nominal b3 saturation nominal design (small <0.5 units)

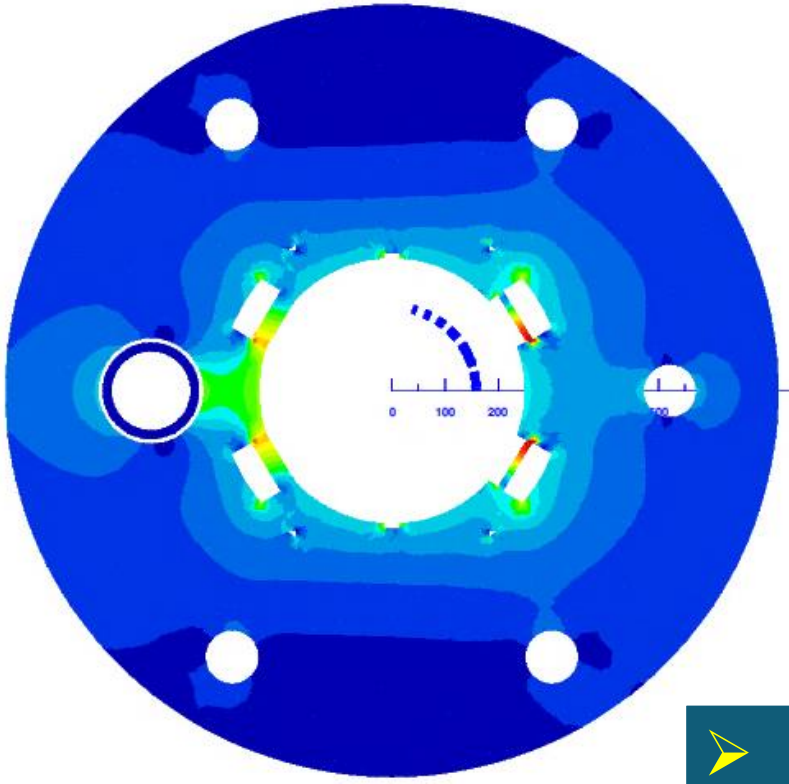
b3 saturation tuned on the positive side







An Example of Correction Possible with Tuning Shim



MAIN FIELD (T) ..... -1.344126
MAGNET STRENGTH (T/(m^(n-1)) ..... -1.3441

NORMAL RELATIVE MULTIPOLES (1.D-4):

b 1:	10000.00000	b 2:	-22.51463	b 3:	-2.34841
b 4:	-3.32559	b 5:	-0.56917	b 6:	0.11132
b 7:	0.05000	b 8:	0.05158	b 9:	-0.37131
b10:	0.00296	b11:	0.33362	b12:	-0.00018
b13:	0.10222	b14:	-0.00003	b15:	0.04215
b16:	-0.00000	b17:	0.00256	b18:	0.00000

Special Case

Symmetric top & bottom;

but not left & right

- **One needs to examine in more details in terms of what is required and see what is practically possible?**
- **With four tuning shims in four slots, one can correct four harmonics (normal and skew); perhaps eight if we use a differential width shims one due to a much large width as compared to that used in RHIC IR Quads**