MA-m & Taper End, L, for $\Delta B/B$ of 1% to 3.2% & $B(L)$ of 1.5 T to 3 T

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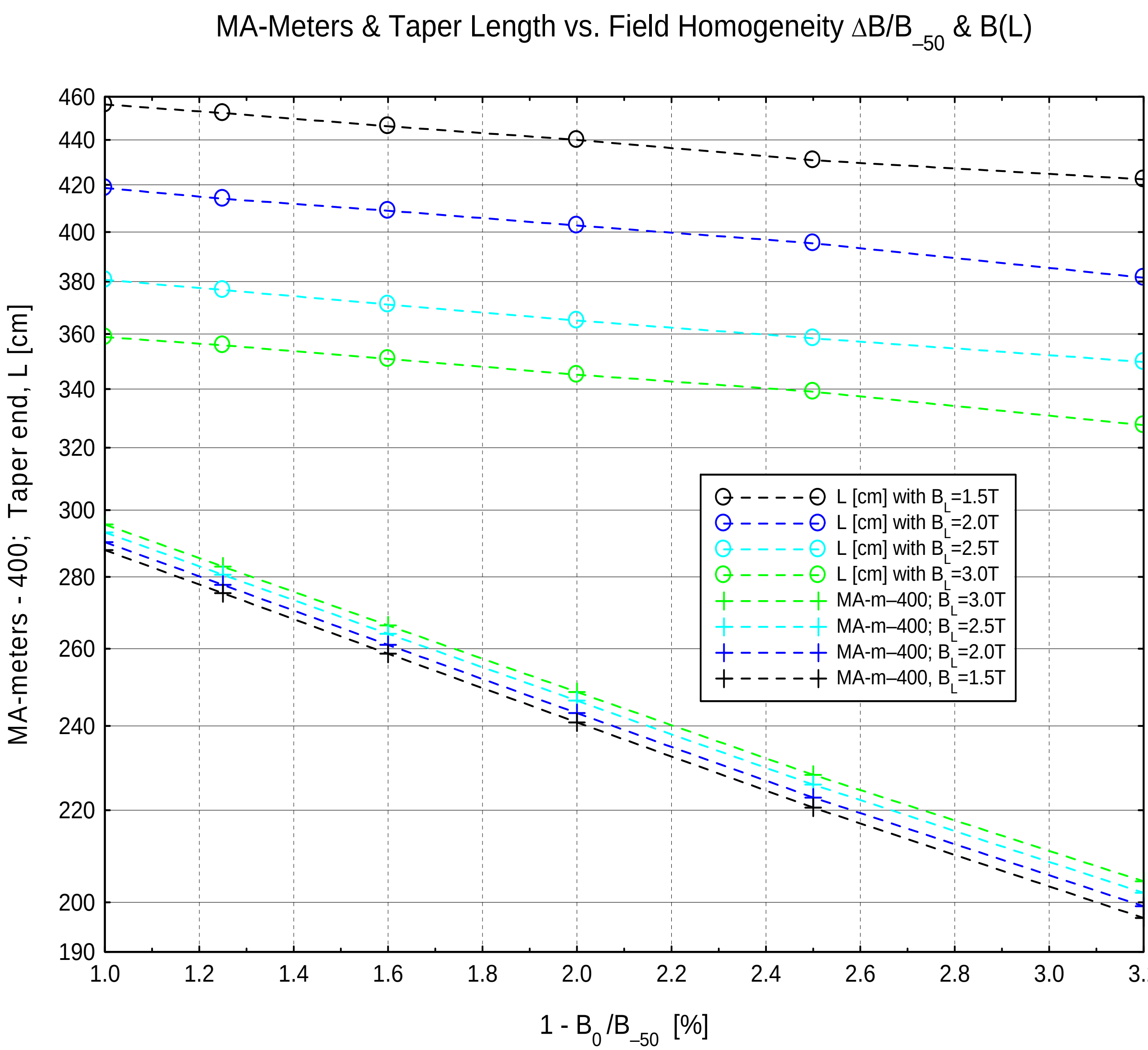
The graph below plots the MA-meters of conductor needed and the taper termination $z = L$ for minimum-conductor designs of Target Magnets whose field homogeneity is 1% to 3.2% and whose field profile ramps from 15 T at $z = -50$ cm to 1.5 T, 2 T, 2.5 T or 3 T over a length dictated by its downstream coil I.R. being 90 cm. The graph on page 2 explains why it is the taper length, rather than the downstream-coil I.R., that is allowed to vary.

For these minimum-volume designs, improving the field homogeneity from 3.2% to 1% increases the conductor usage by ~15% for all values of end field $B_L \equiv B(z \geq L)$. L increases by ~10% as a consequence of the increased length of the main coil. Increasing B_L from 1.5 T to 3 T decreases L by ~22%, the result of truncating a nearly-invariant downward-ramping field profile at $B = 3$ T instead of at $B = 1.5$ T.



The graph below reveals that over the range 60 cm to 120 cm for the I.R. of the downstream coil the taper length ranges only from 382 cm to 415 cm for an illustrative target magnet with 2% field homogeneity and a field profile that bottoms out at 2 T. Only by abandoning the simplicity of the proposed design can one force the taper length to be much different from that achieved with a downstream coil whose I.R. is ~90 cm, as dictated by shielding requirements.