SUPPLEMENT TO SI PARAMETER MEETING No. 43

(Refers to 4. Synchronization between rings)


Subject: Variation of the equivalent magnetic length of PSB Bending Magnets due to eddy currents in the thick end plates during the flat-top.

The above mentioned variation has now been computed for the vertical field component only (see SI/Int. DL/69-2) and is given in the attached figure.

The nominal magnetic field (without eddy currents) is rising up to 600 nsec after which is kept constant during the flat-top. To obtain this, the following Voltage/gap had to be applied (time 0 corresponds to beginning of nominal field rise).

\[ V/\text{gap} = 10.32 \text{ V/sec} \]

From the attached curve, it is seen that the reduction of the \( L_{eq} \) with respect to the case of no eddy currents is \( \sim 3 \times 10^{-4} \) at 600 nsec and decays to \( \sim 1.4 \times 10^{-4} \) at 600 nsec. The total variation during the flat-top is therefore \( \sim 1.6 \times 10^{-4} \).

In addition, one would have to consider the effects associated with the horizontal field component (see SI/Int. DL/69-2). This has not PS/7237/add.
been done, but considering what happens during the main field rise, one can expect a similar contribution.

Altogether one may then expect

\[ \sim 3 \times 10^{-4} \]

total increase of the equivalent length during the flat-top, if the nominal field (without eddy currents or under laminated part) is kept constant.

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\[ \frac{\Delta B}{B} = \text{(Reduction of field under thick end plates)} \]

\[ \frac{\Delta \text{Leq}}{\text{Leq}} \left[ \% \right] = \frac{5}{16.6} \quad \frac{\Delta B}{B} \left[ \% \right] \]

Case of 25mm thick end plates