In calculating the aperture required to accommodate the beam in the machine design presented to the Council Members at the Geneva Conference the assumption was made that the incoming beam would be injected along the ideal orbit, i.e. the circular one. If we assume that we can inject onto the closed orbit itself, however, it is clear that a much smaller aperture can be used, as was pointed out in the talk on Machine Design by JBA and subsequently by many members of the audience. Whether this assumption is justified is not discussed at the moment, except to say that it should be possible to modify the closed orbit to suit the injector or vice versa.

Slide 3 in the talk gave the maximum displacement for injection on the closed orbit as \( y = \hat{y}_c + K \frac{d_s}{2} \), where \( \hat{y}_c \) is the maximum displacement of the closed orbit from the ideal orbit for over 95% of the machines that can be built within the specified tolerances, \( K \) is the beating factor and \( d_s \) is the diameter of the injected beam. We can now calculate the beam displacement against \( n \) and see whether a reduction in \( n \) will improve the magnet design.

Slide 10 gives the necessary details for this calculation.

\[
\begin{array}{cccc}
\text{n} & 100 & 200 & 392 & 900 \\
\text{Vertical Displacement} & 1.13 & 1.14 & 1.23 & 1.26 \\
\text{Radial Displacement} & 4.70 & 2.93 & 2.14 & 1.66 \\
\end{array}
\]

If now we drew the beam cross-section and sketch in suitably sized apertures to contain the beam we can pick the most likely value of \( n \) to give a reasonable shape of vacuum chamber.
Purely from the point of view of the mechanical strength of the vacuum chamber a) and b) are rather wide and the \( n = 392 \) seems a good choice again. The lowest value of \( n \) seems to be 200 on this basis. If we take the \( n = 392 \) size and fit a magnet round it we get a design as follows.

If we now compare these results with the vacuum chamber required for the \( n = 392 \) machine with injection on the ideal orbit we find that the vacuum chamber is down from 6x12 cms to 5x7 cms and the magnet cross-section from 87x114 cms to 51x68 cms. This latter reduction brings the magnet weight down to about 1/3 of the previous weight.