PRELIMINARY RESULTS ON THE PERFORMANCE OF FINAL PROTOTYPE OF JANUS KICKER MAGNET

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The final prototype KM-module for the fast ejection at Serpukhov has been assembled and put into operation. The main modifications with respect to the previous units are the aperture (140 x 100 mm, before 120 x 80 mm) and the change of the ferrites, which were expected to have a better performance. The previous ferrites were of the 4B1 type with H_c = 1,8 oersted, the new ones are of the 4A4 type with H_c = 0,4 oersted. The saturation point is the same for both. A high voltage test (~100.000 shots) has been done and the main parameters measured.

a) Kick strength

The main point of interest was naturally to determine the kick strength at a line voltage of 80 kV. For a value of the end resistor of 5 Ω the kick strength at 80 kV is $3{,}49 \cdot 10^{-2}$ W/m.

The risetime $\tau_{o/100}$ from 0 to 100°/oo of the kick is 160 ns.

The accuracy of the measurements is better than 5°/o.

b) Behaviour of the ferrites (Magnetization curve)

The kick strengths have been measured at different levels of line voltage from 40 to 80 kV. Graph 1 shows a linear relation between the two : no trace of saturation has been found.

c) Kick homogeneity

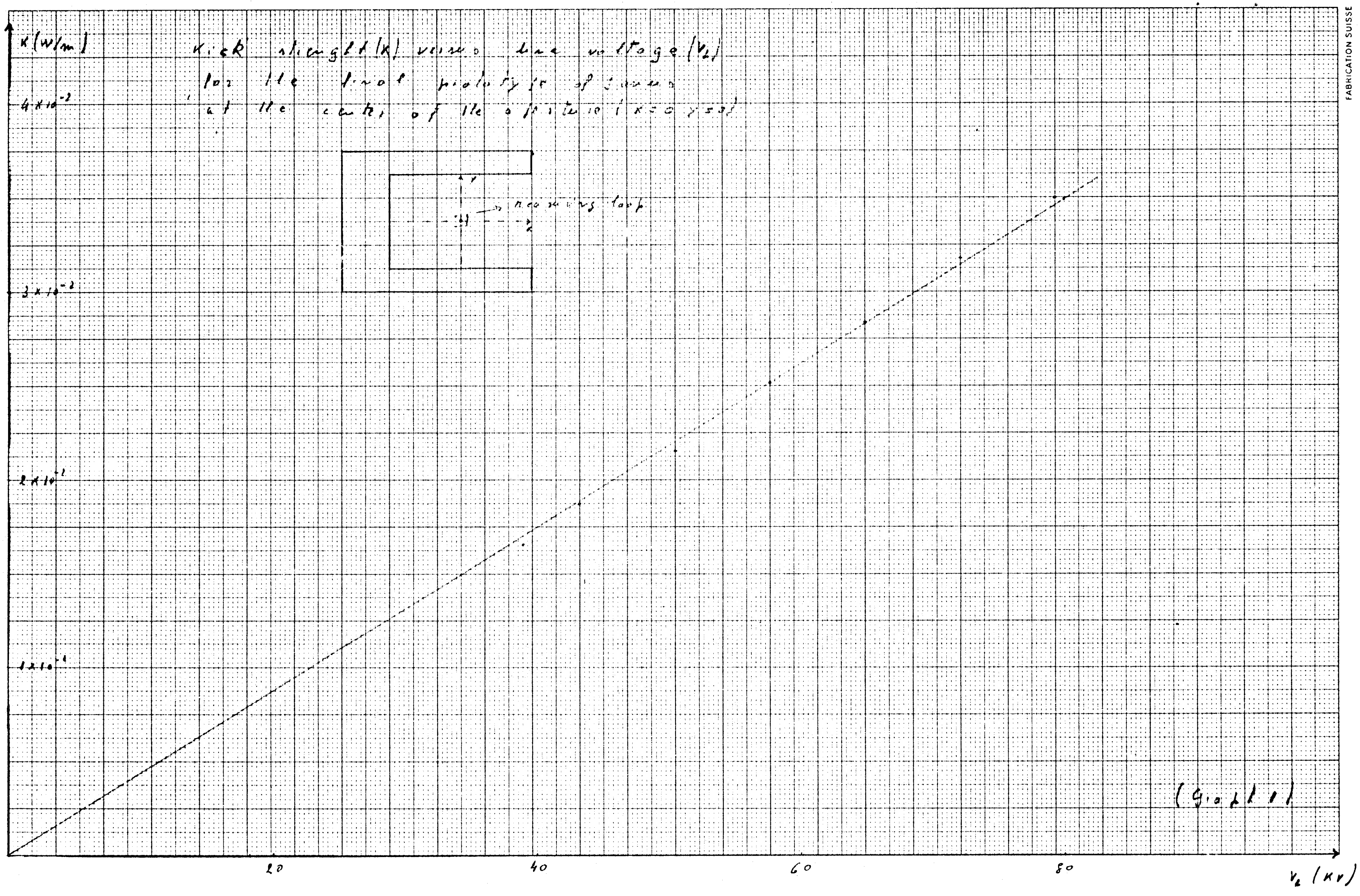
Another main problem was the distribution of the kick along the aperture. For this purpose the measuring loop has been displaced radially. Graphs 1,2 and 3 give the kick strength versus line voltage at the centre (x = 0) near the hot conductor (x = -51 mm) and near the cold conductor (x = +51). Vertically the loop has always been kept in the middle of the aperture (y = 0). Graph 4 shows the kick strengths at 80 kV for the different radial positions : the homogeneity is very good, better than 2°/o.

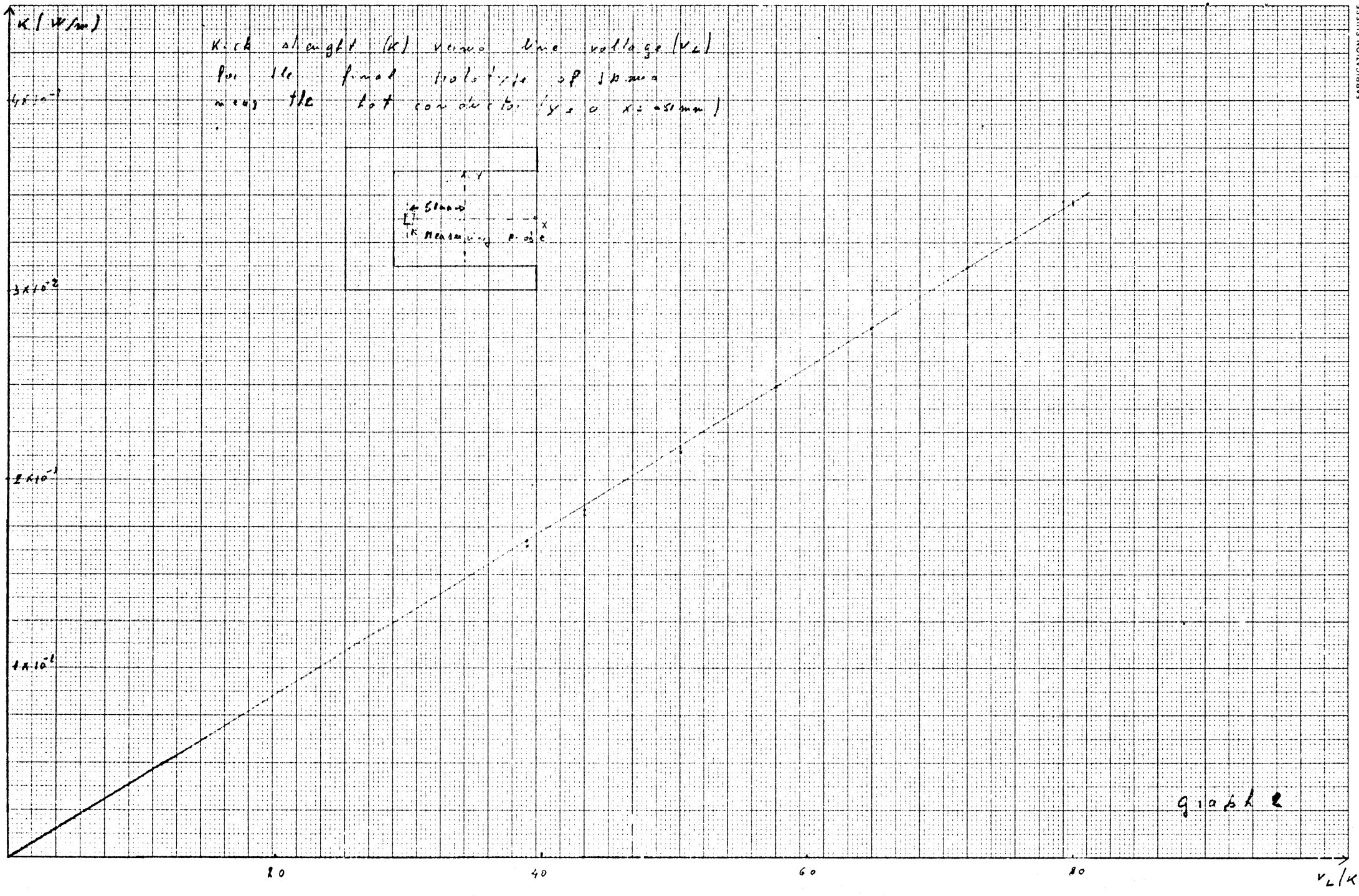
d) Remanent field

For a full aperture kicker the residual field may produce problems at the injection. One of the main reasons for changing our ferrites has been the residual field. The remanent field depends on the polarity, level and length of the pulse : for this reason a program of measurements has been conceived. For the moment we have measured the residual field after a

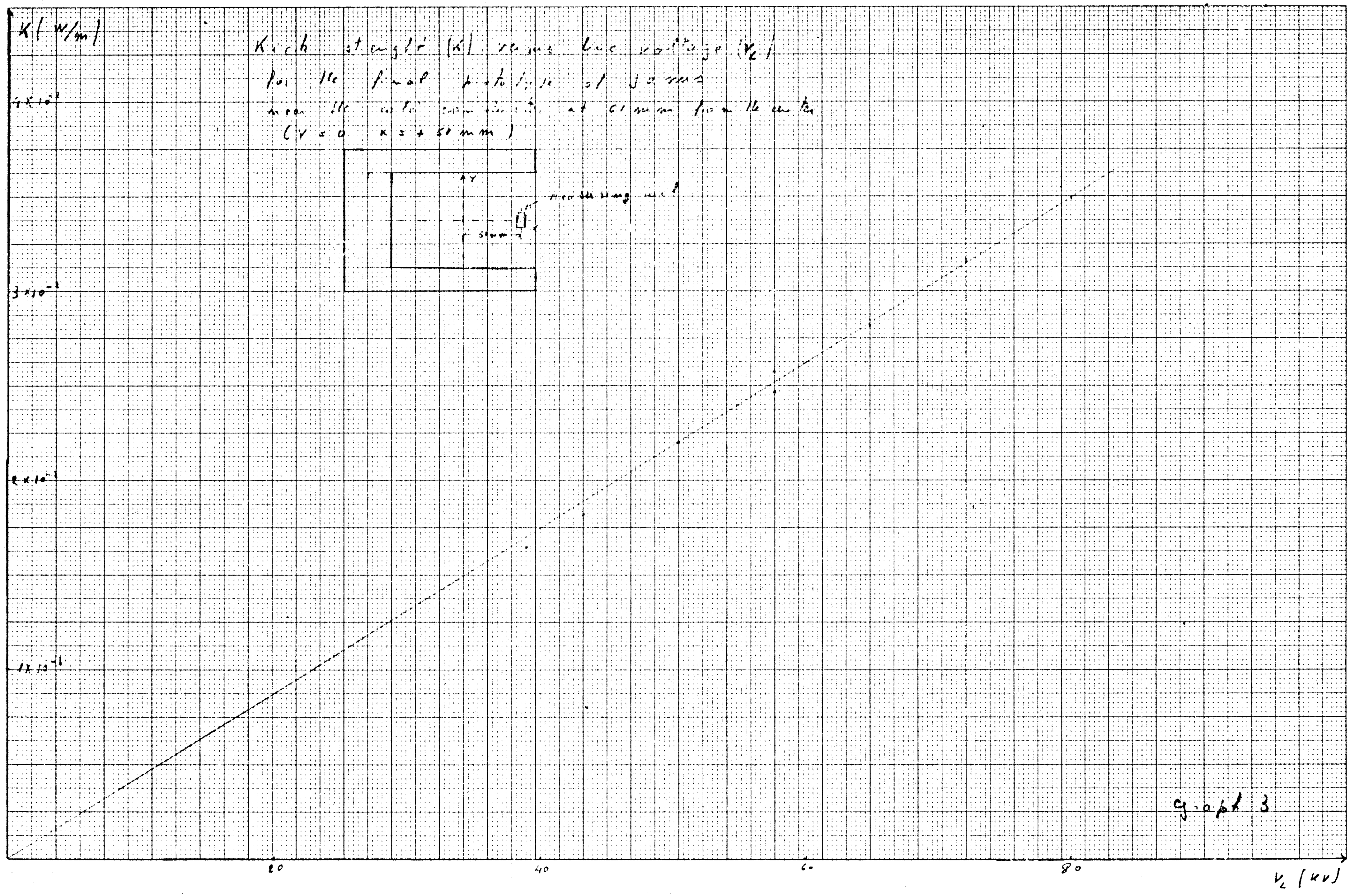
positive pulse 5 μsec long of 40 kV. A qualitative idea of the behaviour of the remanent field at the centre of the aperture is given by graph 5. The measurement is done with a Hall plate and a plotter on line. Graph 6 gives the remanent field, measured in the same way, for the previous unit we tested. The change of ferrites has reduced, by at least a factor 4, the remanent field.

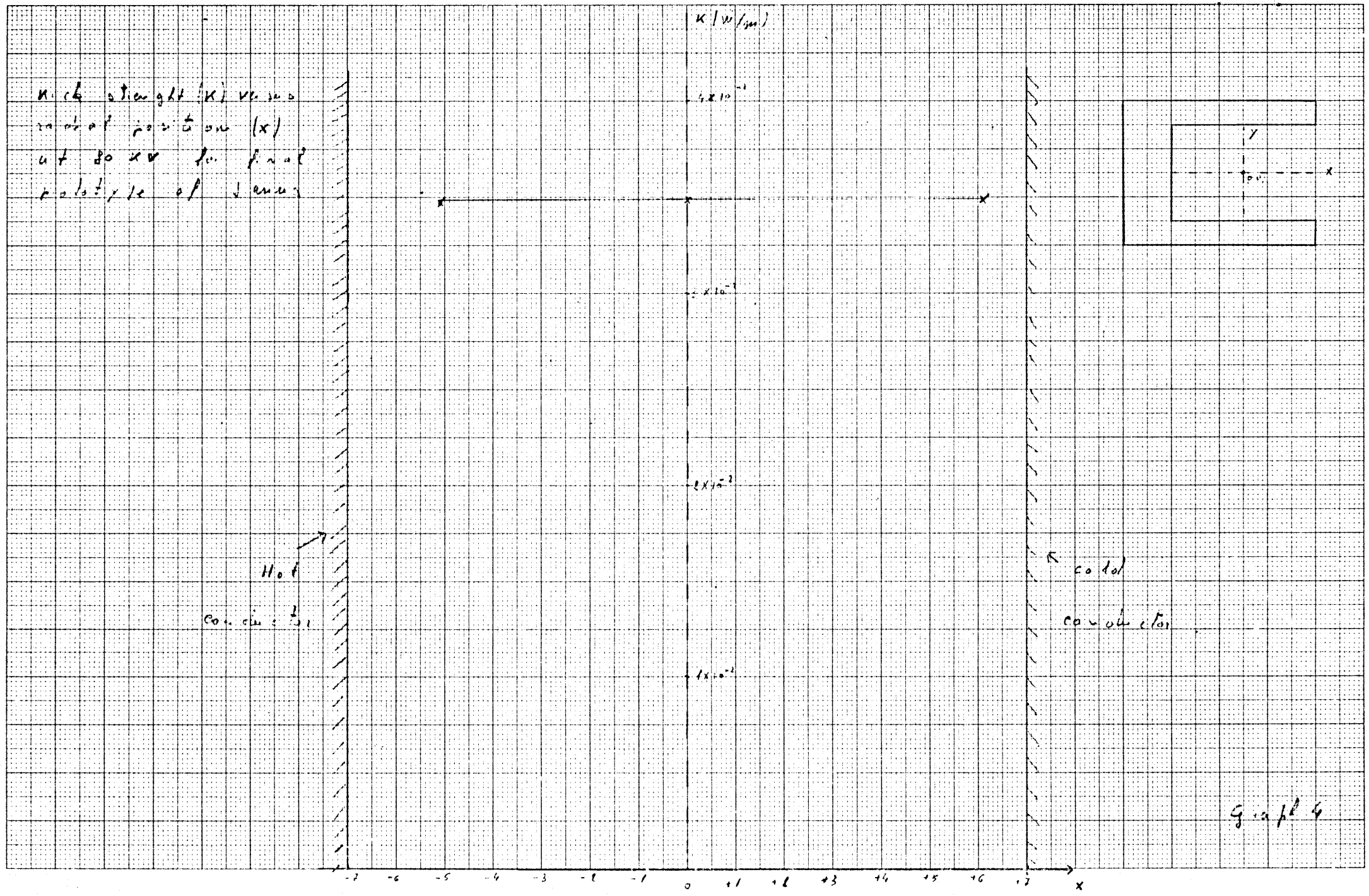
Graph 7 gives the radial distribution of the kick of the residual field for the final prototype. The values were obtained by measuring the variation of flux produced by moving a coil, 418 mm long, from each radial position to a position outside the kicker, where the earth magnetic field was determined. Turning the coil by 180^{o} in the two extreme radial positions and measuring the variation of flux lead to the same results within $5^{o}/o$.





FABRICATION SUISSE





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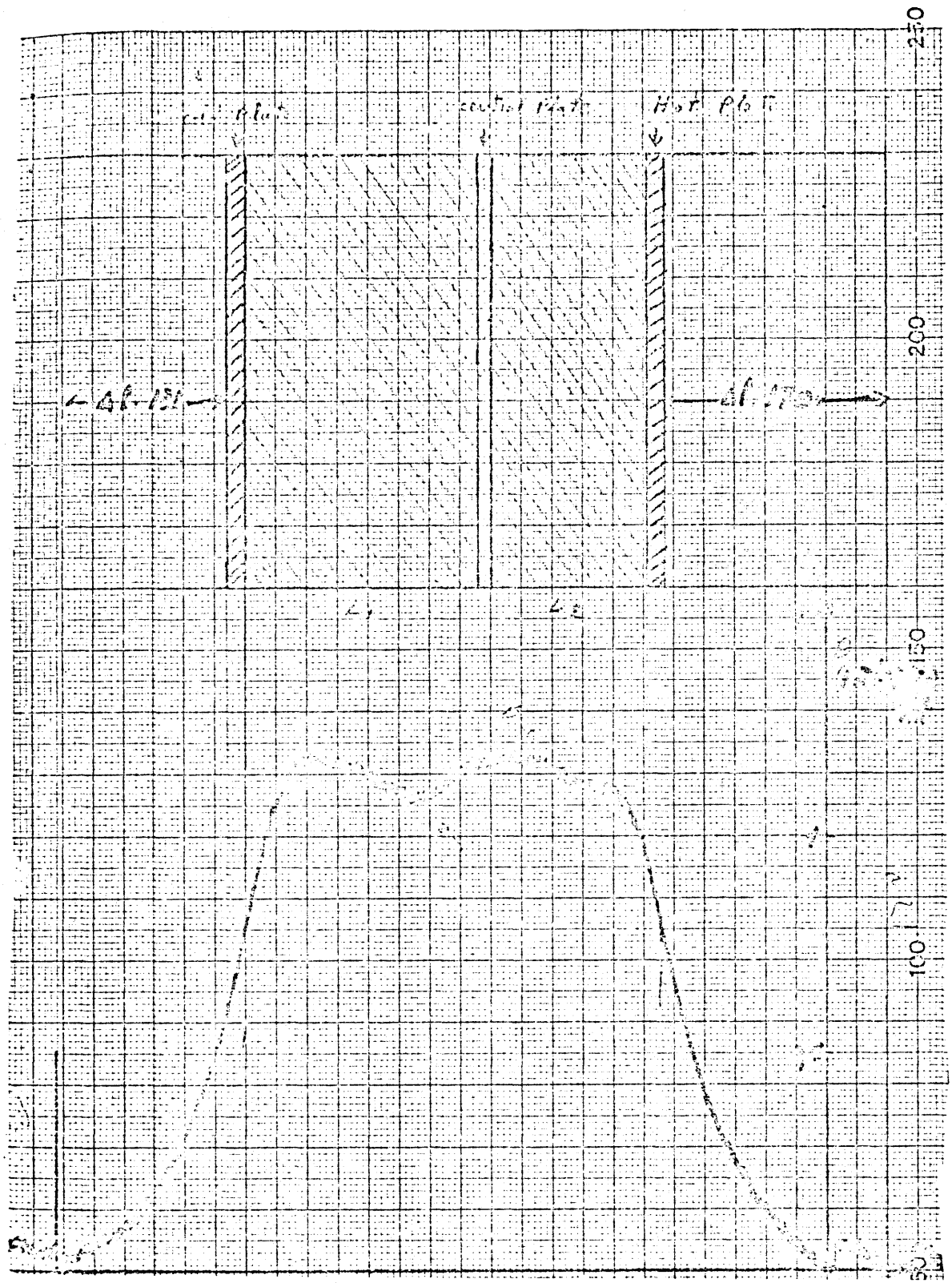
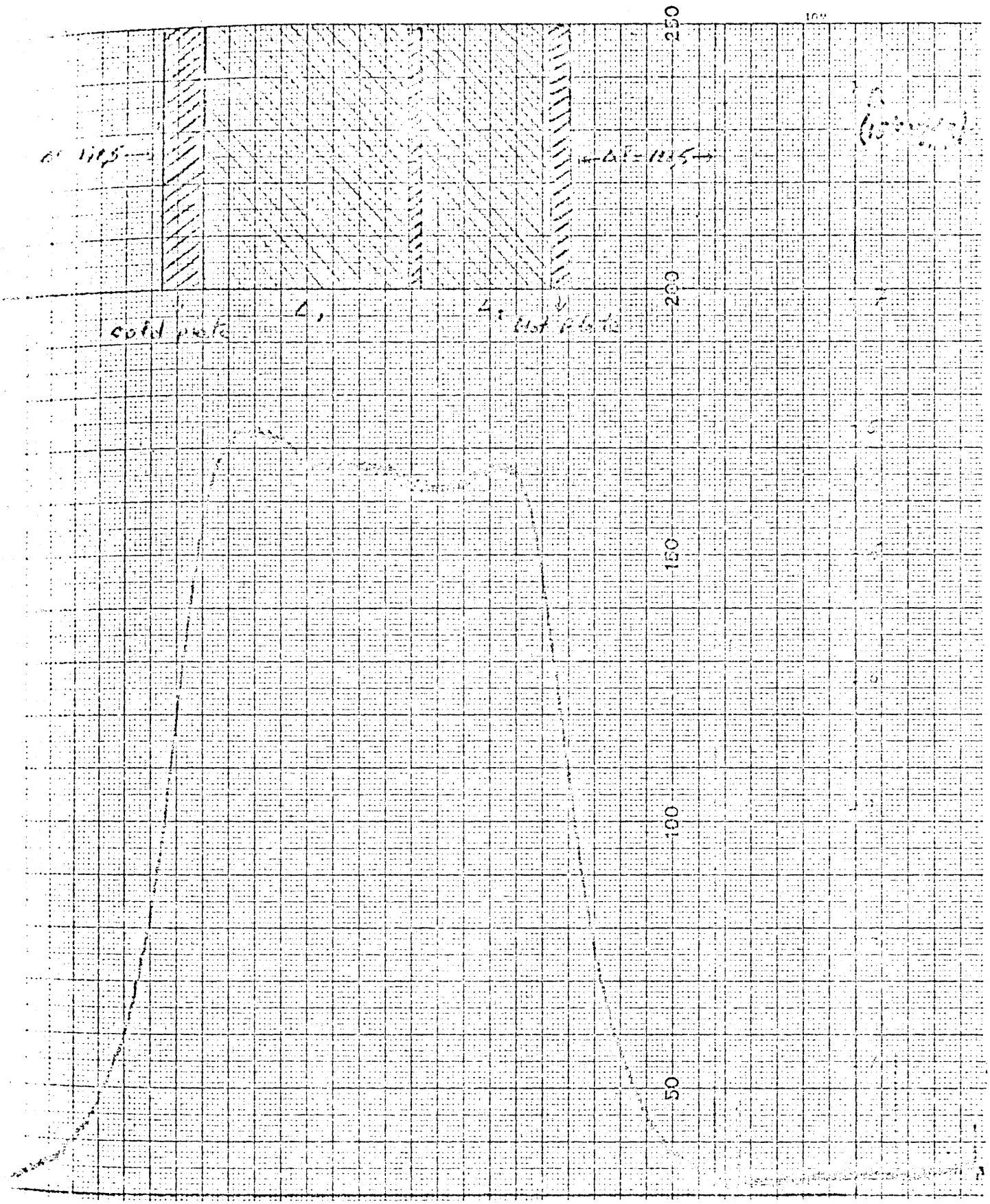


Remanent field for the final prototype of Janus
at x = 0 (center of the gap)

Scale $\begin{cases} x : 100 \text{ mm} = 470 \text{ mm} \\ y : 70 \text{ mm} = 1 \times 10^{-4} \text{ W/m}^2 \end{cases}$

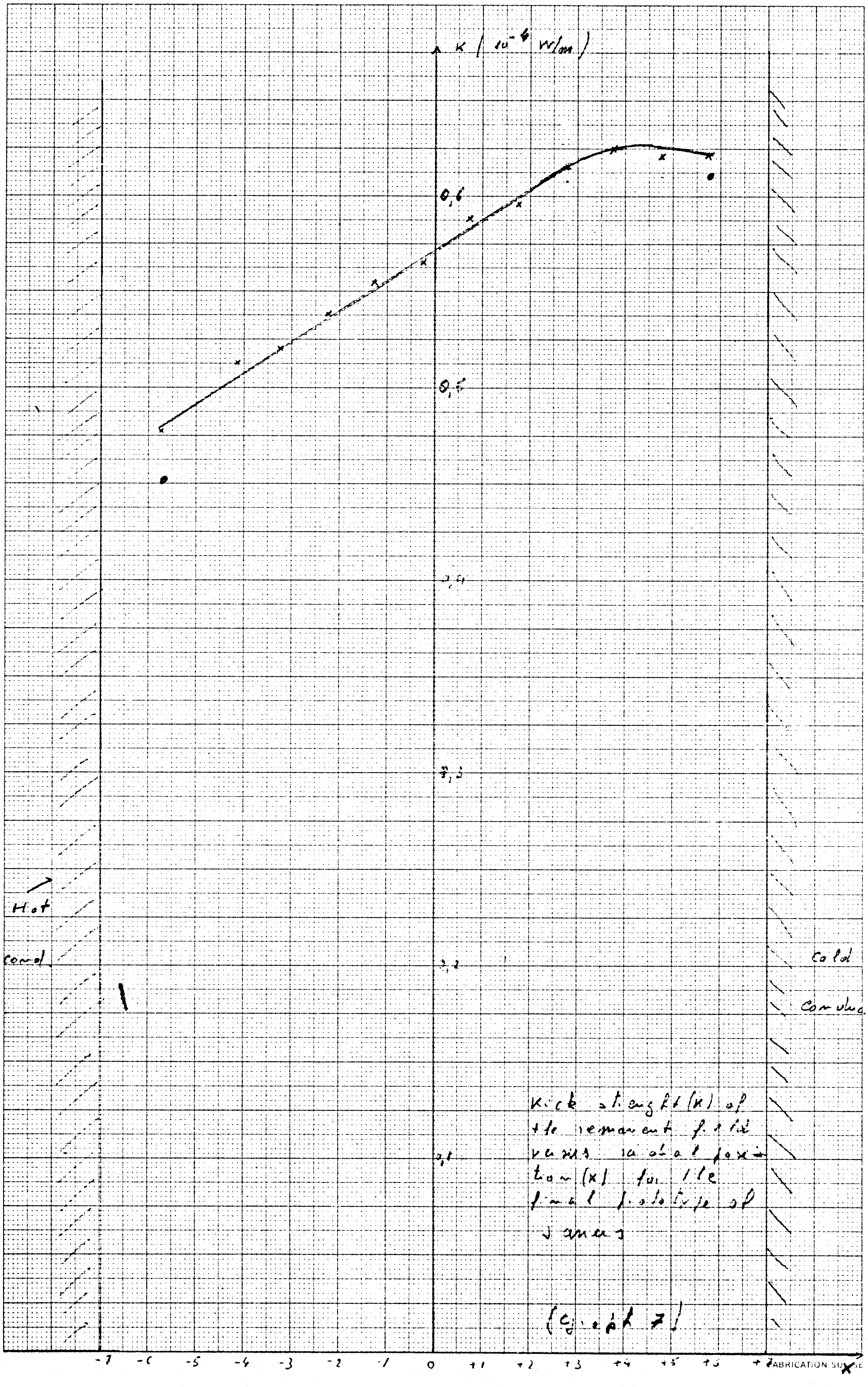
graph 5



Remanent field for the first prototype of Janus at x = 0.

Scale $\begin{cases} x & 100 \text{ mm} = 470 \text{ mm} \\ y & 23{,}9 \text{ mm} = 1 \times 10^{-4} \text{ W/m}^2 \end{cases}$

Graph 6


K (10^-4 W/m)
0,6
0,5
Hot
cond
Cold
Conduc
-7 -6 -5 -4 -3 -2 -1 0 +1 +2 +3 +4 +5 +6 +7
Kick strength (K) of
the remanent field
versus radial posi-
tion (x) for the
final prototype of
(Graph 7)