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ACOL EJECTION KICKER MAGNET PROPOSALS

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Straight sections 35 and 50 are foreseen for ACOL ejection kickers.

Full use of the available straight section length, rise time requirement and a maximum available magnet current of 5200 A lead to a design of two (different) magnet modules per straight section. Each of the four open C-core aperture, transmission line type magnets is excited by its dedicated cable PFN generator and works in a short-circuited mode.

Any three out of the four installed modules will provide the required deflection angle of θ = 10 mrad at their maximum operating voltage of 80 kV.

At present, discussions are held to decide whether centre orbit or off momentum orbit ejection is the optimum solution.

Whereas the kicker vacuum tanks will be almost identical (i.e. ϕ = 1100 mm, L $\sim$ 1400 mm, see figures 1, 2 and 3), the contenance will be quite different.

In table I we give the respective data for the magnets proposed for centre orbit and 3% off momentum ejection.

Basically, the centre orbit ejection requires a wide magnet aperture to clear the 240 π injected beam. This has two main implications.

Firstly, the magnet inductance per unit length is high. With a choice of only two magnets per tank the individual magnetic field rise time will be long. Such that a kick of $\sim$ 2,5% will be given to the last particles preceding ejection and $\sim$ 97,5% to those to be ejected first. Needless to say, there is no margin for timing errors or switch jitter. (Of course a shorter magnet will be "faster", but will not provide enough kick).

Secondly, the amount of ferrite needed for the magnetic circuit is very large. About 450 kp of ferrite/vacuum tank would be required.

In comparison, for a 2,5 to 3% off momentum orbit ejection the beam to be ejected will be more or less aligned with the edge of the 240 π beam, thus no special aperture provisions have to be made for the injected beam. The magnet aperture will be only as wide as required by the good field region and then be much narrower. Therefore, the amount of magnetic material needed is less than half, about 213 kp of ferrite per tank. For off momentum orbit ejection the saving of purchase cost for ferrite is estimated to be a total of between 250 and 280 kFS.

Also, the less inductive magnet is sufficiently fast, there will be enough margin for jitter etc. Further, the vacuum pumping speed required to outgas the ferrite volume will consequently be reduced.

In conclusion, from the kicker team's point of view, an off momentum orbit ejection is highly desirable. There is design margin concerning the good field region and rise time. The magnets are considerably lighter, require fewer vacuum pumps and the saving on ferrite purchase will be exceeding 250 kFS.

Data	Unit	+ or - 3% off momentum ejection		Centre orbit ejection	
		Magnet 1	Magnet 2	Magnet 1	Magnet 2
W	mm	140	130	250	250
W_{eff}	mm	180	170	241	241
h	mm	88	102	88	102
n	cells	24	24	24	24
l_{eff}	mm	600	600	600	600
L	μH	1,54	1,26	2,064	1,78
Z_o	Ω	15	15	15	15
PFN	kV	80	80	80	80
I	A	5200	5200	5200	5200
∫Bdl	G.m	445,5	384,4	445,5	384,4
θ	mrad	3,736	3,22	3,736	3,22
C	pF	6854	5585	9177	7918
T_m	ns	103	83,8	137,7	118,8
T_T	ns	210	172	280	242
B_a	G	743	641	743	641
w_f	mm	85	70	115	100
$V_{f/cell}$	cm^3	946	732	1903	1637
V_f	cm^3	23636	18293	47579	40920
Cost	FS (3 FS/cm^3)	70908	54879	142737	122760
Weight (fer.)	Kp	123	95	247	213
Δ Kick	%	> 99	> 99	< 95	∿ 99

Distribution :

ACOL List
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HDM

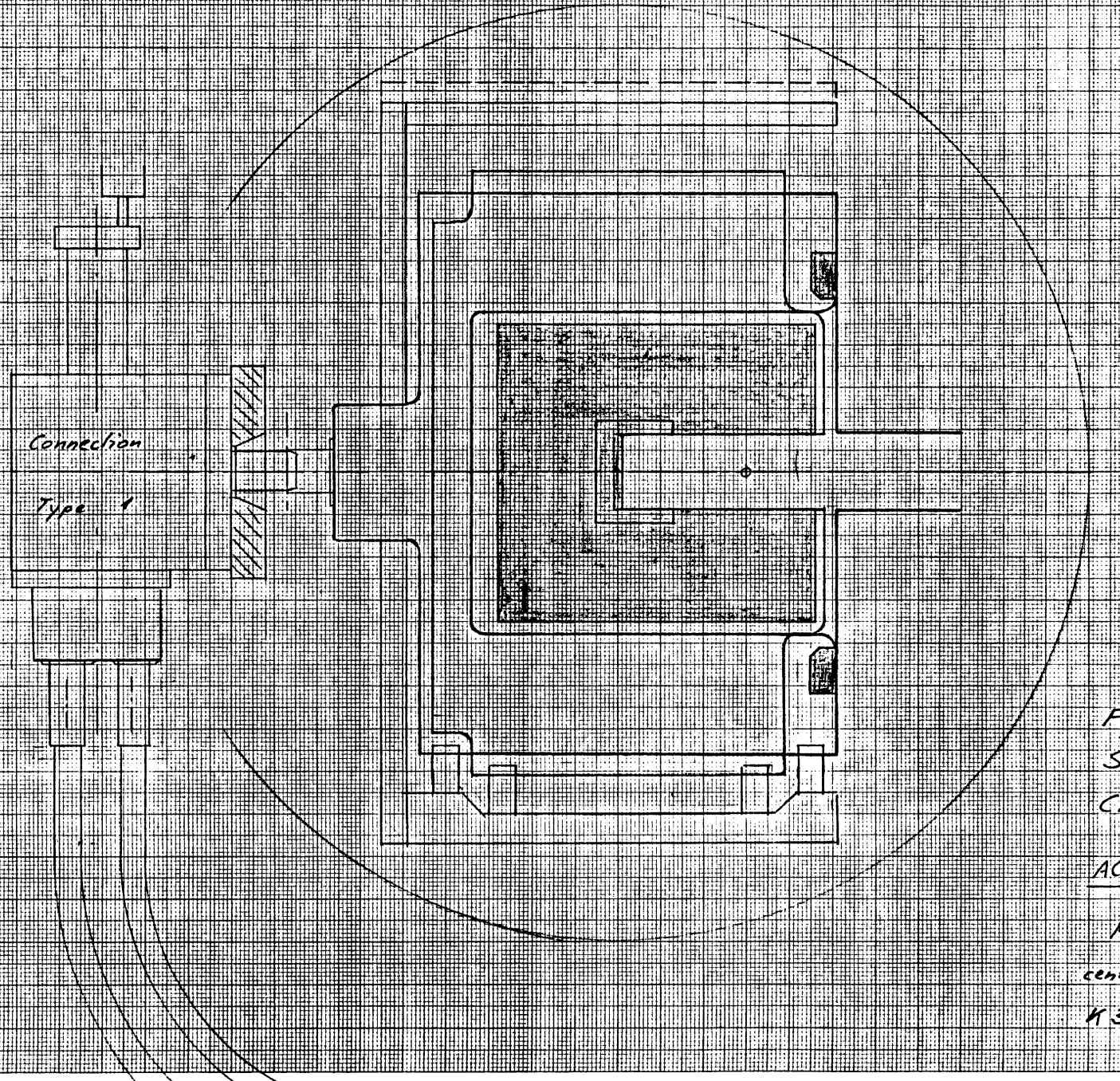

Fig. 1.
Sketch
Cross-section

ACOL Ejection

M 1:5

centre orbit

K35 K50

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KDH

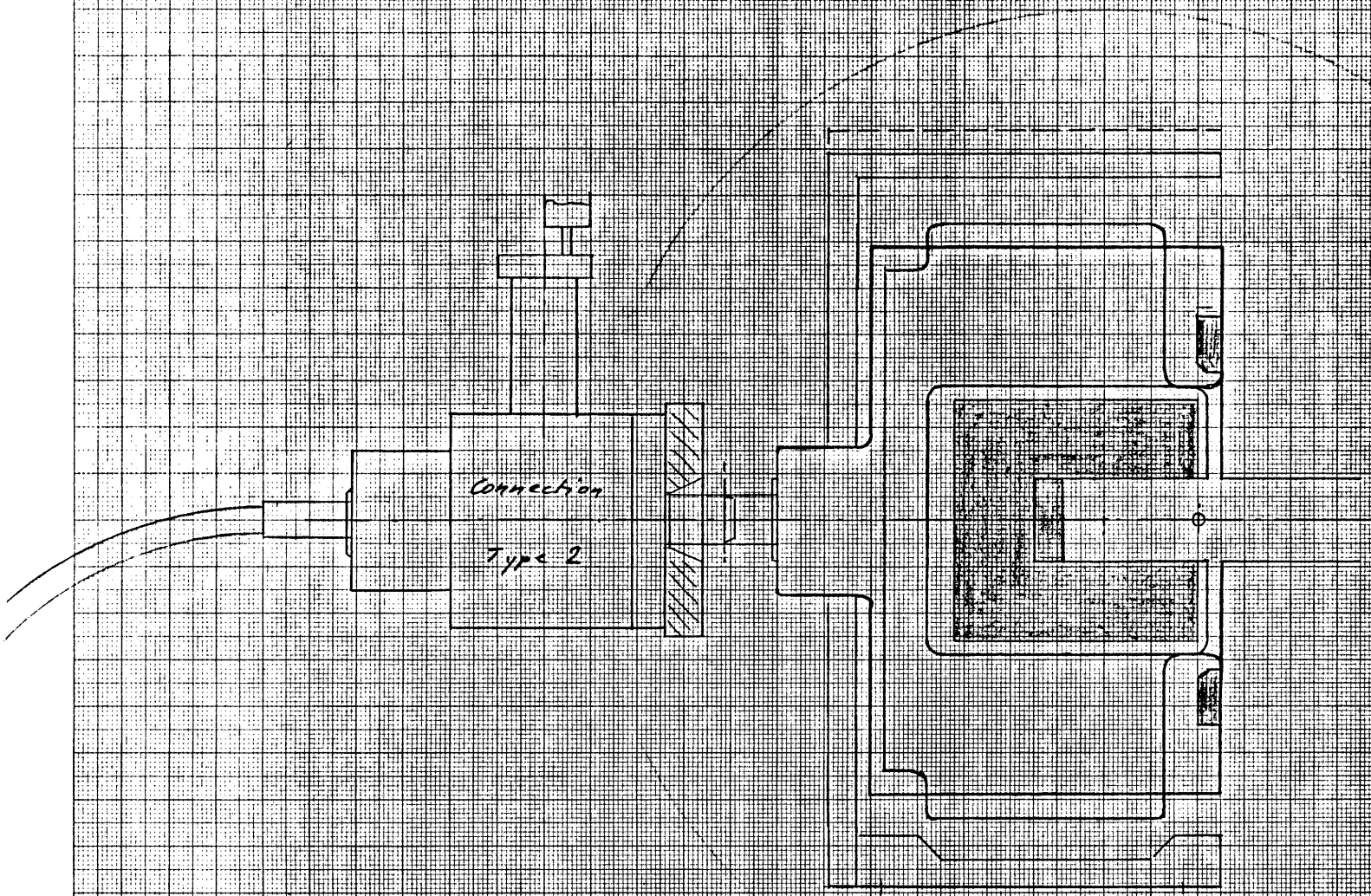

Fig. 2.
Sceteh
Cross-section
ACOL Ejection
M 1:5
off momentum orbit
H 35 K 50

18/1/85
HDM

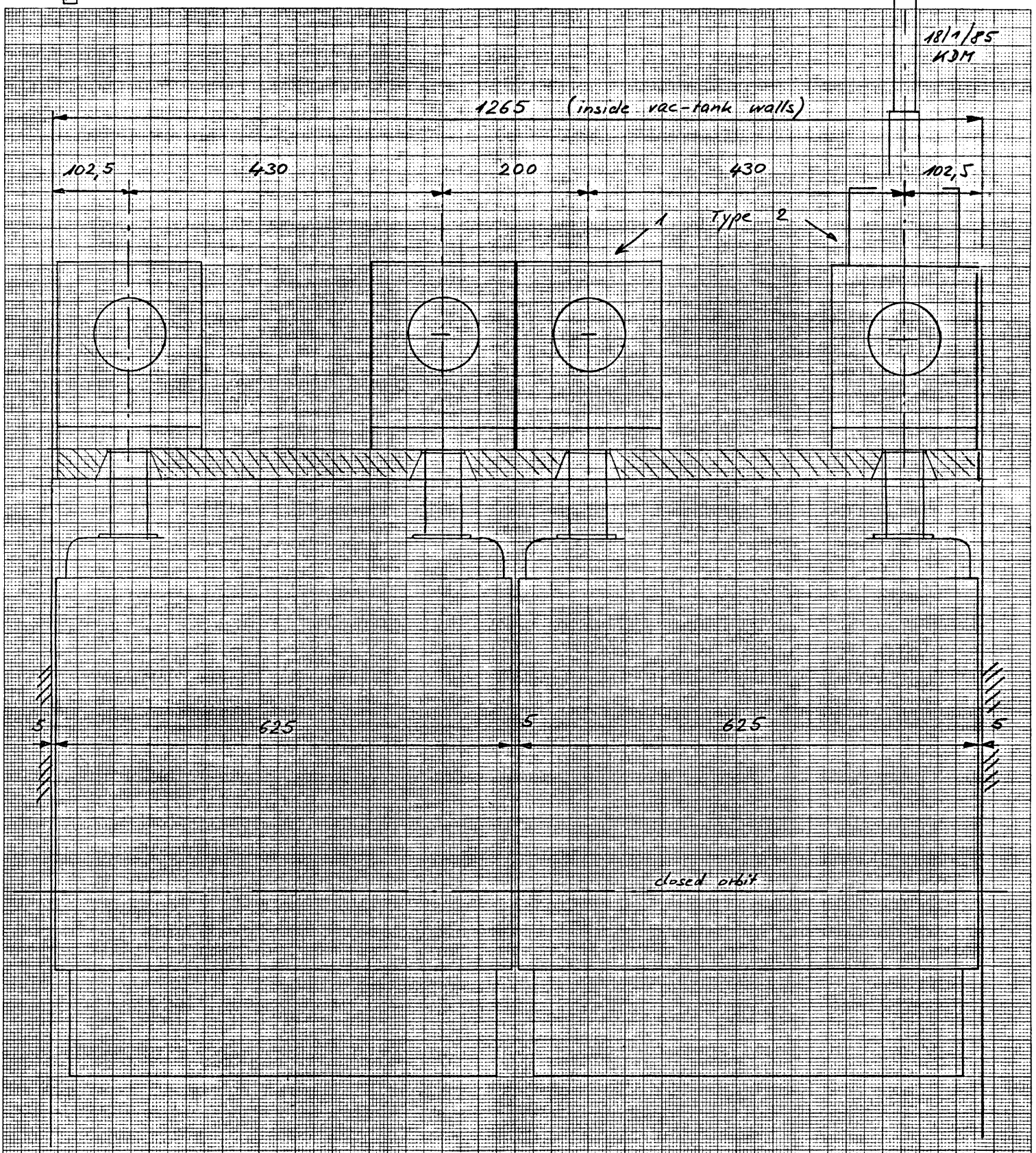

Fig. 3. Sketch of H35 or H50

Top view

2 magnets @ 24 cells

M 1:5