Trim Magnet Configurations for MIPP

David C. Carey

MIPP Collaboration Meeting

Fermi National Accelerator Laboratory
Batavia, Ill. 60510
10 May 2003

From raja@fnal.gov Tue Apr 29 10:08:16 2003
Date: Mon, 28 Apr 2003 11:00:20 -0500
From: Rajendran Raja <raja@fnal.gov>
To: Dave Carey <davec@fnal.gov>
Subject: Fw: 4-4-30 properties

[The following text is in the "iso-8859-1" character set.]
[Your display is set for the "US-ASCII" character set.]
[Some characters may be displayed incorrectly.]

Dave,

Here is an exercise for you. We have 4 trims in our beamline (Crol 6 latest). I presume you have the transport deck for this, if not let me know. For a secondary beam momentum of 100 GeV/c, what is the current at which you have to run these trims to produce a 1 cm deviation at the secondary target?

All trims are 4-4-30 whose properties are given in the weblink below.

Raja
----- Original Message -----
From: "David Harding" <harding@fnal.gov>
To: "Raja Ragendran" <raja@fnal.gov>; "Carol Johnstone" <cjj@fnal.gov>
Sent: Friday, April 25, 2003 3:04 PM
Subject: 4-4-30 properties

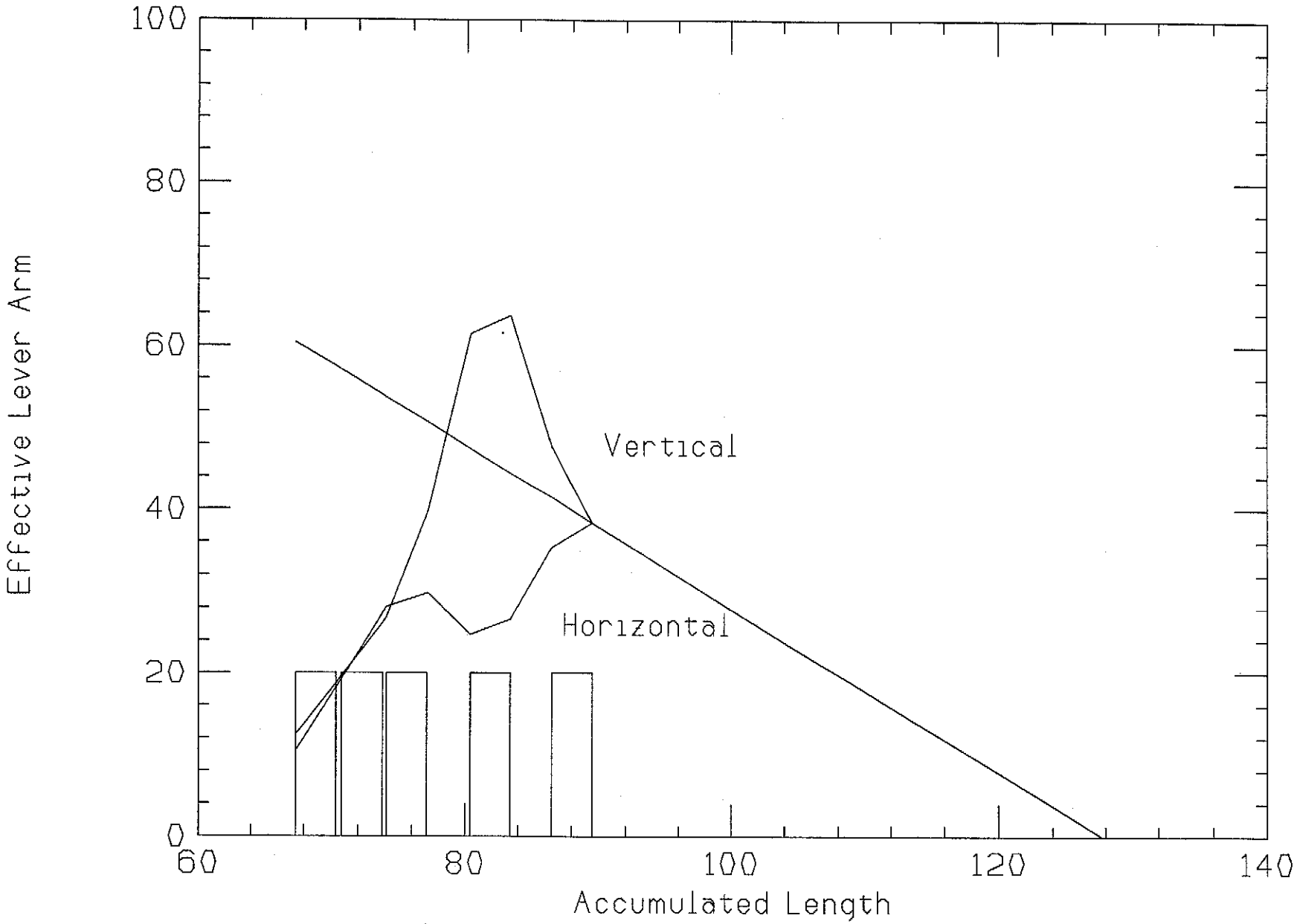
> http://tdserver1.fnal.gov/AcceleratorSupport/MiniBooNE/VernierDipoles/
>
> Based on our thermal measurements, I wouldn't want to run these over 125 A.
>
> Of the four magnets that we have in IB2 at the moment, three have a back leg of
> 4.40" and one has a back leg of about 5.2". I haven't looked at the last one
> still at TPL. On two of the 4.40" ones, the coil is larger than the gap, so the
> steel doesn't quite close. We propose to make a simple shim to fill in the
> space, making a back leg (and gap) of about 4.6". The exact dimension will
> depend on what steel we can find in stock.
>
> For the 4.6" magnet we would get a transfer constant of about 0.002 T-m/A, or
> 0.25 T-m at my suggested maximum of 125 A.
>
> Each of these four magnets has a different beam tube configuration (one has no
> beam tube). Bill Robotham, our engineer, is asking Christine Ader what she
> wants us to do about that.
>
> Let me know if you need any more information.
>
> -Dave Harding
>

Dave,

Here is an exercise for you. We have 4 trims in our beamline (Carol 6 latest). I presume you have the transport deck for this. If not let me know. For a secondary beam momentum of 100 GeV/c, what is the current at which you have to run these trims to produce a 1 cm deviation at the secondary target?

All trims are 4-4-30 whose properties are given in the weblink below.

Raja


100
80
60
40
20
0
Effective Lever Arm
Vertical
Horizontal
60
80
100
120
140
Accumulated Length

Of the four magnets that we have in IB2 at the moment, three have a back leg of 4.40" and one has a back leg of about 5.2". I haven't looked at the last one still at TPL. On two of the 4.40", the coil is larger than the gap, so the steel doesn't quite close. We propose to make a simple shim to fill in the space, making a back leg (and gap) of about 4.6". The exact dimension will depend on what steel we can find in stock.

For the 4.6" magnet we would get a transfer constant of about 0.002 T-m/A, or 0.25 T-m at my suggested maximum of 125 A.

Field for Kicker Patterns

	HK6A	HK6B	VK6A	VK6B
HV HV	-3.56 kG	1.96	-11.70	11.49
HV VH	-3.31	1.55	-15.33	13.57
VH VH	-4.30	2.12	-12.80	9.27
VH HV	-4.76	2.81	-10.56	8.48

Kick for Kicker Patterns

HV HV	HK6A	HK6B
L =	0.762 m	0.762 m
B =	-3.32 kG	1.53 kG
LB =	2.53 kG-m	1.17 kG-m
	VK6A	VK6B
L =	0.762 m	0.761
B =	-15.33 kG	13.57 kG
LB =	-11.68 kG-m	10.34 kG-m

Strength of Steering Elements

MC6DS1	MC6DS0
MC6DS1	L = 3.048 m B = 7.86 kG r_S = -0.126 LBr_S = 3.02 kG - m
MC6DS0	L = 3.048 B = 4.8 kG r_S = 0.066 LBr_S = 0.966 kG-m

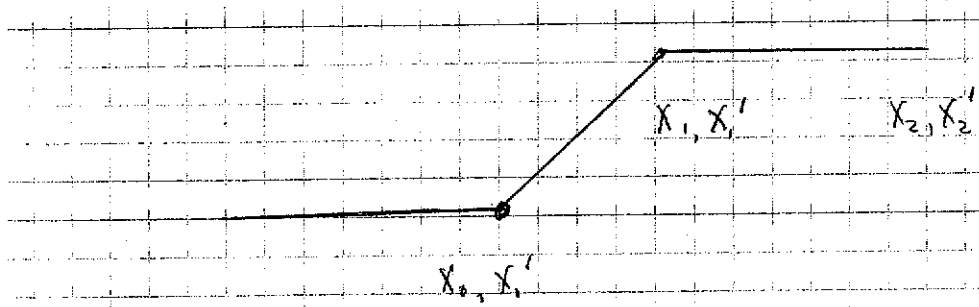
Hybrid Trim Schemes

MC6DS1	VK6B
MC6DS1	L = 3.048 m B = 2.908 kG r_s = -0.103 LBr = 2.53 kG – m
VK6B	L = 0.762 m B = 0.2678 kG LB = 0.204 kG - m

Carol's Kick Scheme

	VT1	HT1	VT2	HT2
Horiz	0.0	-0.046	0.0	-1.55
Vert	-0.496	0.0	-2.519	0.0

Point to Parallel



$$R = \begin{pmatrix} R_{11} & R_{12} \\ R_{21} & R_{22} \end{pmatrix}$$

$$R_{22} = 0$$

Only one independent field necessary