

F Note #495

AP2 Reworked Left Bend Magnet Measurement Report
Part I, Strengths

David Harding and Dejan Trbojevic
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The left bend in the AP2 beamline is composed of two SDE dipoles and four 6-3-120's. In order to increase the vertical aperture of the line we have opened the gap of these magnets. The 6-3-120's have become 6-4-120's and the SDE gaps were increased proportionately. All of the magnets were measured before being installed in 1985. One each of the two magnet styles was remeasured after the modifications. The strengths of the field integrals are compared here.

Table 1 shows data taken when the magnets were originally built. We include only the measurements taken with the same test coil (#53) that we used on the reworked magnets. Table 2 contains measurements of the reworked magnets. Table 3 shows the ratios of the old to the new field strengths for the two magnet types and the ratio of the two types for the old and the new. For the comparisons we have used, first, typical slope values and, second, slope*900 Amps. We see that the ratio of the integrated field strength has changed by 5%. However, we see that the rebuilt magnets seem to be closer to the ratio of field strengths that we have been using in our beamline modeling than the were the old measurements. This leads us to the conclusion that we do not need to change the placement of the magnets in the tunnel.

The 6-3-120 or 6-4-120 is known as an SDF to the measurement system. The original 6-3-120's were spares for the external beamlines and had serial numbers with two digits. The reworked magnets, as 6-4-120's, start a new series and are numbered 1 through 4. Since there is no overlap with the previous numbers, we adopt the names SDF001 through SDF004. The reworked SDE's start a new set of serials, 10x, where the original serial number was 00x.

The quantity FB SLOPE is the volt-seconds/Amp measured as the slope of a straight line fit to the measured response as a function of current (usually just zero and the stated current, but sometimes including some intermediate currents). The integrated strength in Tesla-meters is obtained by dividing the coil constant (width times number of turns) into the slope and multiplying by the measurement current.

Table 1a
Strength of SDE magnets as built

FC MAGNET ID	Current	FB SLOPE	T-m
SDE001	540	-2.4837E-04	2.030
	555	-2.4772E-04	2.081
	579	-2.4768E-04	2.171
	579	-2.4768E-04	2.171
	579	-2.4770E-04	2.171
	603	-2.4778E-04	2.264
	655	-2.4772E-04	2.457
	681	-2.4757E-04	2.555
	704	-2.4762E-04	2.640
	716	-2.4747E-04	2.683
	751	-2.4734E-04	2.811
	753	-2.4746E-04	2.822
	785	-2.4717E-04	2.937
	819	-2.4697E-04	3.063
	851	-2.4675E-04	3.179
	885	-2.4646E-04	3.304
SDE002	555	-2.4773E-04	2.082
	603	-2.4776E-04	2.264
	655	-2.4771E-04	2.456
	704	-2.4761E-04	2.640
	753	-2.4744E-04	2.823
SDE003	555	-2.4758E-04	2.080
	555	-2.4751E-04	2.080
	603	-2.4759E-04	2.262
	604	-2.4756E-04	2.263
	655	-2.4754E-04	2.454
	655	-2.4755E-04	2.455
	704	-2.4745E-04	2.638
	704	-2.4745E-04	2.638
	753	-2.4731E-04	2.820
	753	-2.4729E-04	2.821
SDE004	555	-2.4743E-04	2.079
	603	-2.4745E-04	2.261
	655	-2.4739E-04	2.454
	704	-2.4729E-04	2.635
	753	-2.4712E-04	2.818
SDE005	555	-2.4758E-04	2.080
	603	-2.4758E-04	2.262
	655	-2.4751E-04	2.455
	704	-2.4740E-04	2.637
	753	-2.4722E-04	2.820
SDE006	555	-2.4745E-04	2.079
	603	-2.4748E-04	2.261
	655	-2.4742E-04	2.453
	704	-2.4730E-04	2.636
	753	-2.4713E-04	2.818

Table 1b
Strength of SDF magnets as built

FC MAGNET ID	Current	FB SLOPE	T-m
SDF026			
	481	-3.4921E-04	2.545
	508	-3.4898E-04	2.686
	543	-3.4883E-04	2.868
	543	-3.4827E-04	2.865
	569	-3.5024E-04	3.017
	603	-3.4883E-04	3.187
	631	-3.4812E-04	3.325
	665	-3.4694E-04	3.492
	694	-3.4610E-04	3.638
	723	-3.4461E-04	3.773
	724	-3.4493E-04	3.780
	753	-3.4335E-04	3.915
	780	-3.4164E-04	4.037
	814	-3.3862E-04	4.176
	844	-3.3573E-04	4.290
	876	-3.3230E-04	4.406
	905	-3.2889E-04	4.508
	936	-3.2521E-04	4.607
	961	-3.2217E-04	4.689
	997	-3.1747E-04	4.793

Table 2
Strength of rebuilt AP2 magnets

FC MAGNET ID	Current	FB SLOPE	T-m
SDE102	102	-1.8572E-04	0.288
	202	-1.8787E-04	0.575
	302	-1.8902E-04	0.864
	401	-1.8969E-04	1.152
	501	-1.9009E-04	1.441
	600	-1.9032E-04	1.729
	704	-1.9041E-04	2.029
	804	-1.9040E-04	2.317
	852	-1.9035E-04	2.457
	902	-1.9031E-04	2.599
	902	-1.9027E-04	2.599
	951	-1.9017E-04	2.739
	1002	-1.9002E-04	2.883
	1101	-1.8963E-04	3.161
	1200	-1.8900E-04	3.435
1200	-1.8992E-04	3.452	

FC MAGNET ID	Current	FB SLOPE	T-m
SDF001	102	-2.5936E-04	0.402
	202	-2.6301E-04	0.805
	302	-2.6466E-04	1.210
	401	-2.6552E-04	1.613
	501	-2.6593E-04	2.016
	599	-2.6596E-04	2.414
	702	-2.6564E-04	2.825
	802	-2.6495E-04	3.219
	851	-2.6429E-04	3.406
	901	-2.6323E-04	3.592
	950	-2.6168E-04	3.766
	1002	-2.5947E-04	3.936
	1101	-2.5380E-04	4.230
	1200	-2.4695E-04	4.488
	1200	-2.5852E-04	4.699

Table 3
Relative strengths of AP2 magnets

	SDE	SDF	ratio
old slope	2.477	3.290	1.328
new slope	1.900	2.630	1.384
ratio	1.304	1.251	
old T-m @900	3.379	4.508	1.334
new T-m @900	2.599	3.592	1.382
ratio	1.300	1.255	
TRANSPORT (KG)	9.951	11.192	
TRANSPORT (in)	98.425	123.083	
TRANSPORT (T-m)	2.488	3.499	1.406