Setting of SHMS Dipole

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The SHMS Dipole has a bend angle of $\theta_B = 18.4°$. For p = 11 GeV/c momentum the integral field, Bdl, is 11.783 Tm from:

$$Bdl = P * \theta_B/.2998 \tag{1}$$

The ratio between the arc length along the bend angle, L_{arc} and the chord length, L_{chord}, is

$$L_{arc}/L_{chord} = (\theta_B/2)/\sin(\theta_B/2) = 1.004 \tag{2}$$

for $theta_B = 18.4°$ deg. Therefore, the integral field along a straight path of 11.732 Tm.

From a TOSCA model, SHMSD2008.map, I determined an effective length of the SHMS dipole as 2.855 m which would mean that the maximum field would be 4.1083 T. Holly measured 4.0766425 T at a current of 3450 A. The ratio is 1.0078 . During KPP, the SHMS dipole was set to currents according to I= p*3450/11 . For 2.2 GeV, the maximum field should be 0.82166 T. From Holly's fit to the measured data, 2.2 GeV is .8175 T and current of 690.00 A. This is a ratio of 1.0051. Holly's fit will take care of the difference between 2.2 and 11 GeV.

So it comes down to how well, the SHMS dipole effective length is known. It seems that it will be tough to know it to 0.5% or 1.4 cm. From the measurements that Steve provided, I do not know if it is possible to tell. Where the maximum field stays relatively constant the agreement with TOSCA is at 0.1% level but the drop is not described well enough. It seems that the data have a smaller effective length than the TOSCA model. I do not know how this TOSCA model compares to SHMSD2008.map. I guess that we will have to wait until the HEEPCHECK determines the central momentum. The X focal plane position changes 1 mm for every 0.06%.