2.317 GeV Elastic Calibration Simulations with the Target Coil Obstruction Included

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I have written a subroutine for SIMC which checks the polarized target coil obstruction for both the proton and the electron arm. The results are largely unchanged from my previous simulations where the coil obstruction was not included, with the exception of a few runs at $\theta_p = 30.70^o$. At that setting, the coil blocks about half of the electrons en-route to the calorimeter. Since the rates for the $\theta_{HMS} = 30.70^o$ runs were already low, I suggest that we reduce the collected statistics there. The rates and times in Table I assume 400 elastic counts per 4×4 cm^2 crystal as the desired minimum for the calibration for all settings except $\theta_{HMS} = 30.70^o$, where a 200 count minimum was used. This leaves the elastic calibrations beam time total at nearly the same value as in the PAC31 proposal.

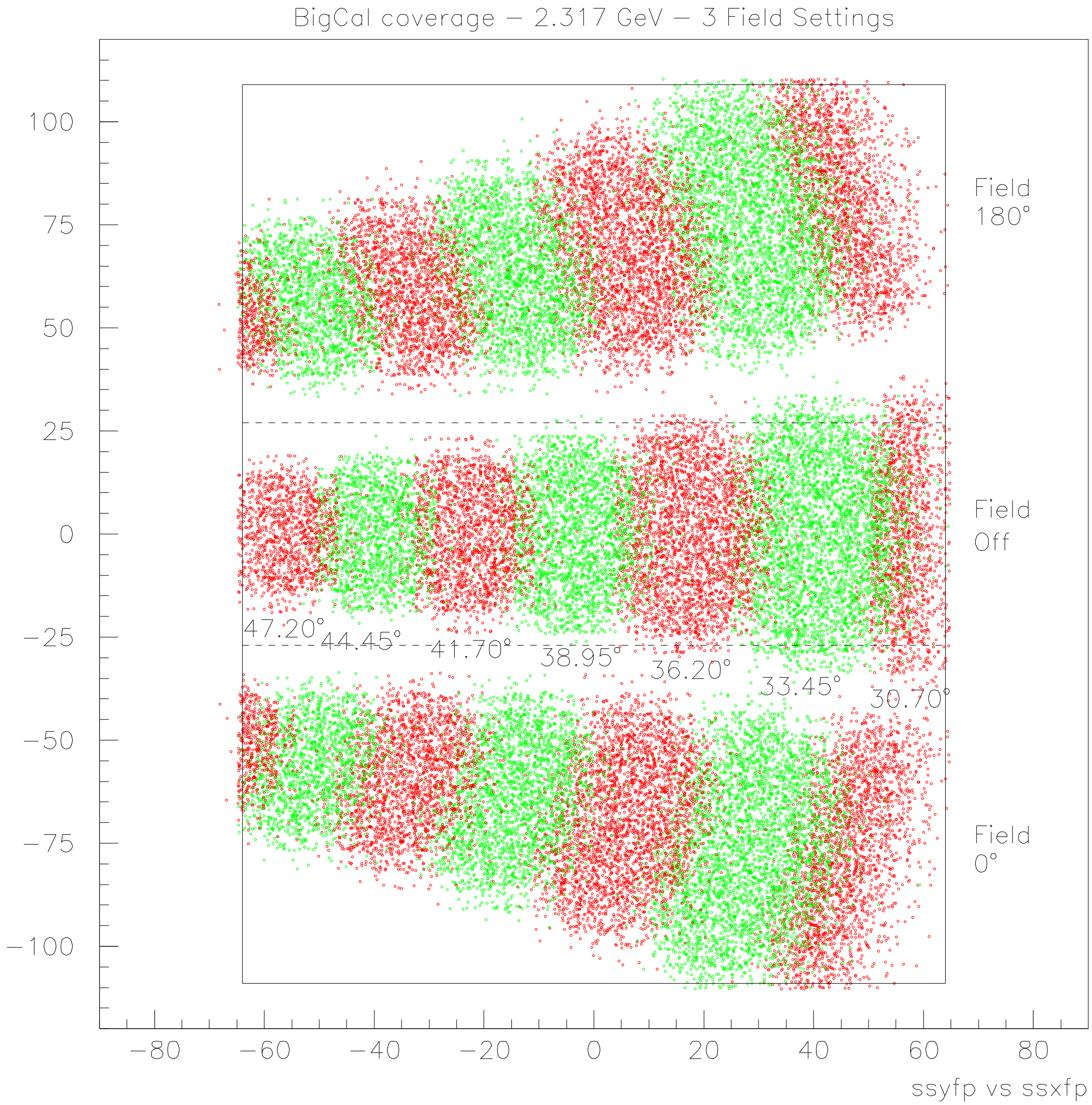

FIG. 1: Simulated locations of electron hits across the calorimeter for the various HMS (proton) angle settings and target field orientations listed in Table I. BETA is set at an angle of 40^o and 320 cm from the target throughout. The effect of the target coil obstruction is clearly seen for the settings on the right edge of the plot. Please note that the calorimeter 'focal plane' coordinates are reversed from the physical geometry, i.e. the $+x$-axis (vertical scale) points downwards, and the $+y$-axis (horizontal scale) points to the left.

2.317 GeV $e + p$ elastics										
$E_{e'}$	$\theta_{e'}$	Q^2	θ_p	p_p	Counts/cell/hr			Beam time (hrs)		
(GeV)	(deg)	(GeV^2)	(deg)	(GeV)	0^o Field	180^o Field	Field Off	0^o Field	180^o Field	Field Off
1.92	30	1.07	47.20	1.19	1500	1500	2610	0.3	0.3	0.2
1.66	33	1.22	44.45	1.29	1730	1690	1890	0.3	0.3	0.3
1.58	36	1.38	41.70	1.39	1010	1010	1090	0.4	0.4	0.4
1.49	39	1.55	38.95	1.50	560	550	600	0.8	0.8	0.7
1.39	43	1.73	36.20	1.61	310	300	330	1.3	1.4	1.3
1.29	47	1.92	33.45	1.72	160	170	180	2.5	2.4	2.3
1.19	50	2.11	30.70	1.84	37	36	44	5.4*	5.6*	4.6*
Half-Field Rates										
1.92	30	1.07	47.20	1.19	2450	2510		0.2	0.2	
1.66	33	1.22	44.45	1.29	1850	1810		0.2	0.2	
1.58	36	1.38	41.70	1.39	1070	1070		0.4	0.4	
1.49	39	1.55	38.95	1.50	580	580		0.7	0.7	
1.39	43	1.73	36.20	1.61	325	320		1.3	1.3	
1.29	47	1.92	33.45	1.72	175	180		2.3	2.3	
1.19	50	2.11	30.70	1.84	41	39		4.9*	5.2*	
Total Time (100% efficiency)								21	22	10

TABLE I: Elastic scattering kinematics and projected BETA+HMS coincidence rates as determined from a SIMC simulation including the effect of the 5.1 T target magnetic field, the beam slow raster, etc. The proton is detected in the HMS and the scattered electron is in BETA, which is positioned at 40^o and 320 cm from the target throughout. The rates are per hour per 4×4 cm^2 cell assuming a beam current of 1 μA and the 3 cm target. * indicates that 200 counts per cell is used in the time computation, instead of 400 counts.

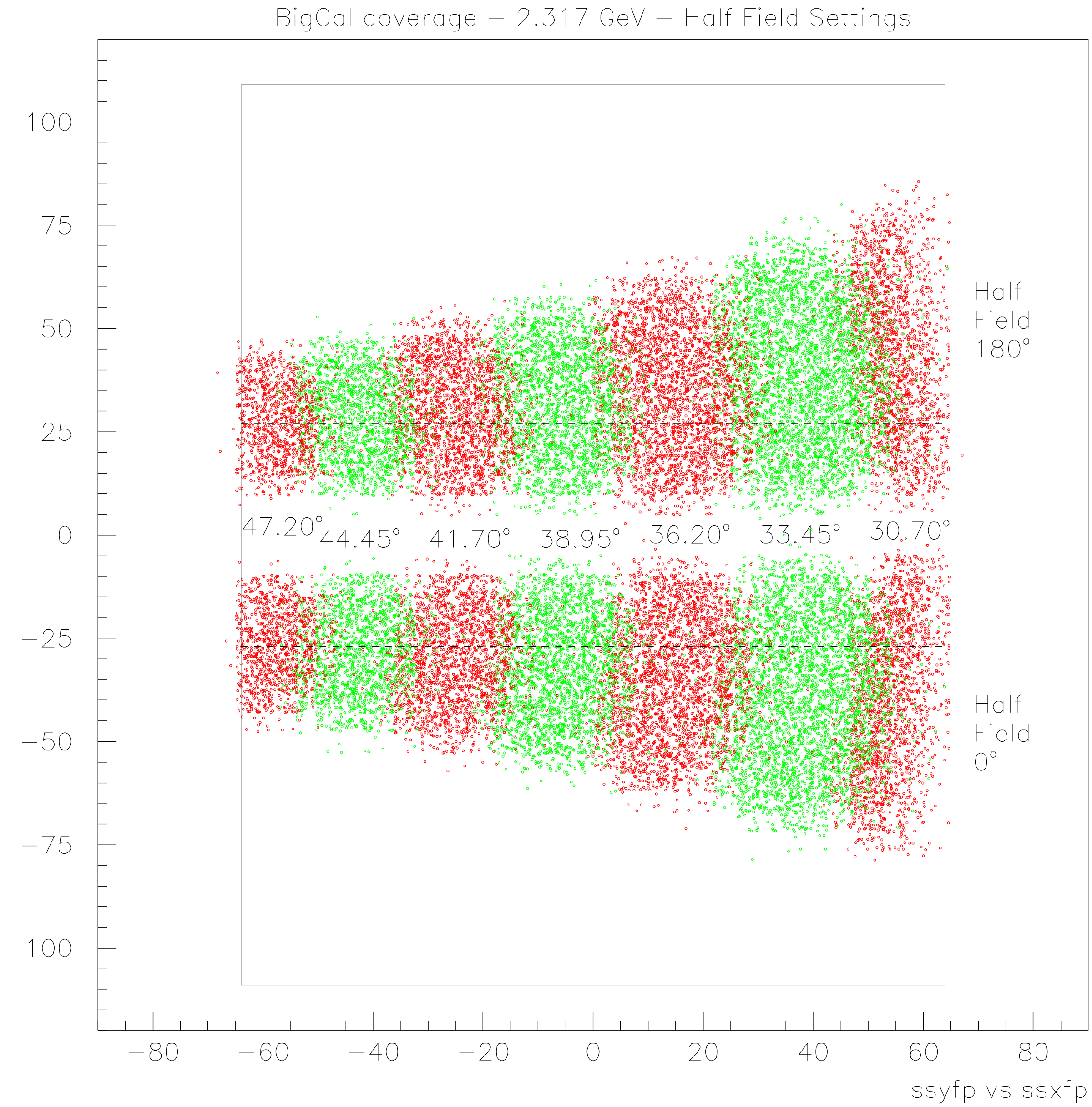

FIG. 2: Simulated locations of electron hits across the calorimeter for the half-field settings listed in Table I. BETA is set at an angle of 40^o and 320 cm from the target throughout.