SANE Elastics Calibration Run Plan v1.2

September 16, 2008

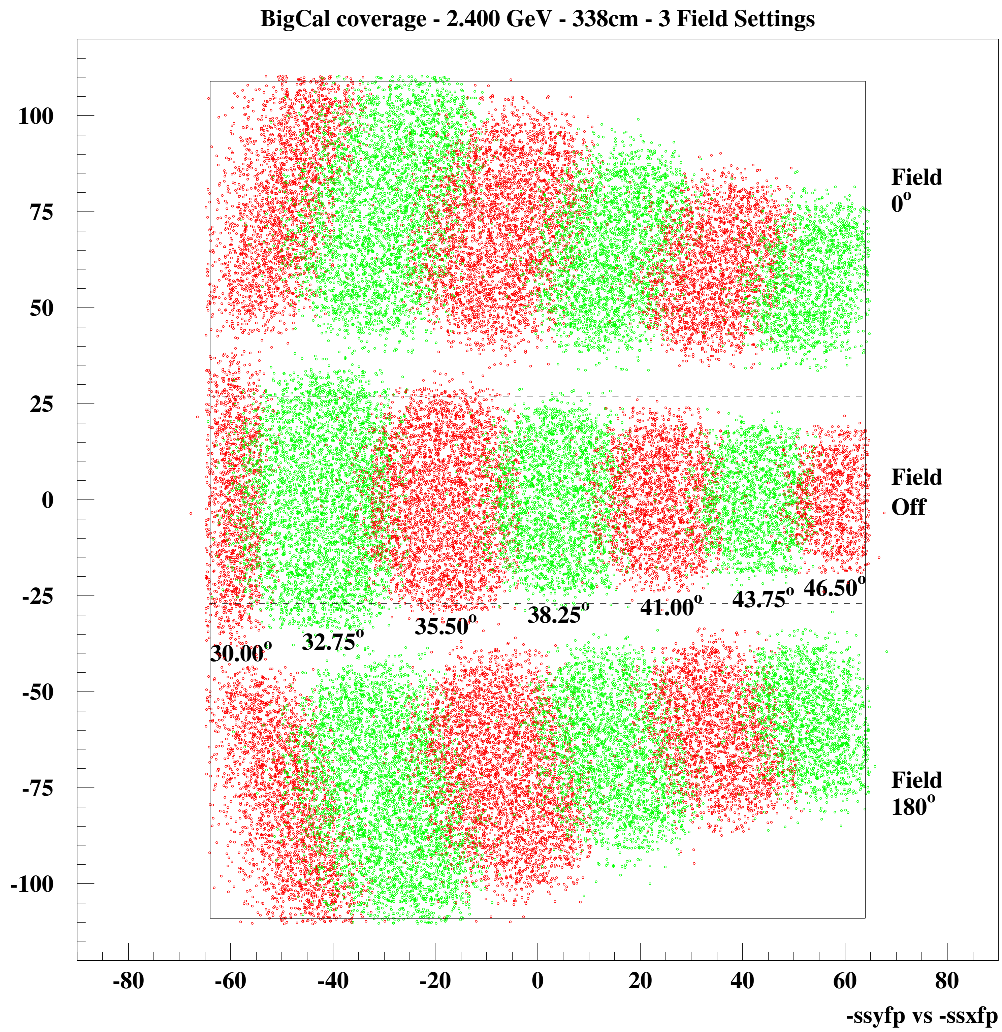
1. Establish 1167 MeV/pass Linac gradient - Tune 2 pass, 2.400 GeV beam.
2. The following tasks can be performed somewhat in parallel:
   (a) Beam energy measurement.
   (b) Set HMS for negative polarity (electrons).
   (c) HMS focal plane checkout. Use C disk target.

Zero Field Calibration Runs

1. After the HMS focal plane checkout is completed, set up the following configuration:
   (a) 1 μA beam, 1 cm slow raster, centered on target.
   (b) Set HMS for positive polarity (protons) and a momentum of 1.233 GeV/c, magnets properly cycled.
   (c) While setting the HMS momentum, record the zero-field ADC gains for all BigCal blocks illuminated with the Gain Monitor light (15 min). These ADC centroids will serve as reference values for the rest of the experiment so be sure they are stored in an easily identifiable manner.
   (d) HMS pion collimator.
   (e) Prescale factor PS1(HMS)=1:PS2(BigCal)=100:PS3(Coin)=1. Every elastics proton in the HMS should yield a coincidence in the BigCal, so PS1=1 will give tracking efficiency and backgrounds information. PS2=100 should give about 100Hz of BigCal singles events to disk.
2. BETA Lucite and Cherenkov checkout continues in parallel.
3. **ep coincidence runs $\Rightarrow$ 9 hrs (@100% efficiency)**

   Take one run for each of the following HMS momentum and angle settings. The scattered electron energy and angle on the BigCal are given for reference only. Note that the event estimate is for hydrogen elastics only, and does not include π^0 events and quasi-elastics from Nitrogen.

   Also note that this ordering is non-optimal in that the HMS quads will need 100A cycling for each setting. This cycling will take 15-30 min per setting. This ordering was chosen, nonetheless, because it allows the high rate runs to be completed before the low rate runs.



P_{HMS}	θ_{HMS}	E'_e	$\theta_{e'}$	Elastics/run	Elastics/cell	Time (@100% eff)	(@80% eff)
1.233	46.50	1.789	30	11k	400	12 min.	15 min.
1.334	43.75	1.706	33	17k	400	17 min.	21 min.
1.443	41.00	1.617	36	21k	400	30 min.	38 min.
1.555	38.25	1.522	39	26k	400	55 min.	69 min.
1.670	35.50	1.423	43	32k	400	100 min.	125 min.
1.789	32.75	1.318	47	18k	200	120 min.	150 min.
1.907	30.00	1.213	50	4k	100	180 min.	225 min.

Half Field 0^o Calibration Runs

1. Set up the following configuration:

   (a) Target field ramped to 2.5016 Tesla, 0^o orientation, unpolarized. Check field sign.

   (b) 1 μA beam, 1 cm slow raster, centered on target.

   (c) Set HMS for a momentum of 1.233 GeV/c, magnets properly cycled.

   (d) While setting the HMS momentum, record ADC gains for all BigCal blocks illuminated with the Gain Monitor light (15min) and make HV adjustments to bring the ADC values back to their reference (zero field) values. Repeat gain monitor if needed. Record these HV values as they will be needed later.

   (e) HMS pion collimator.

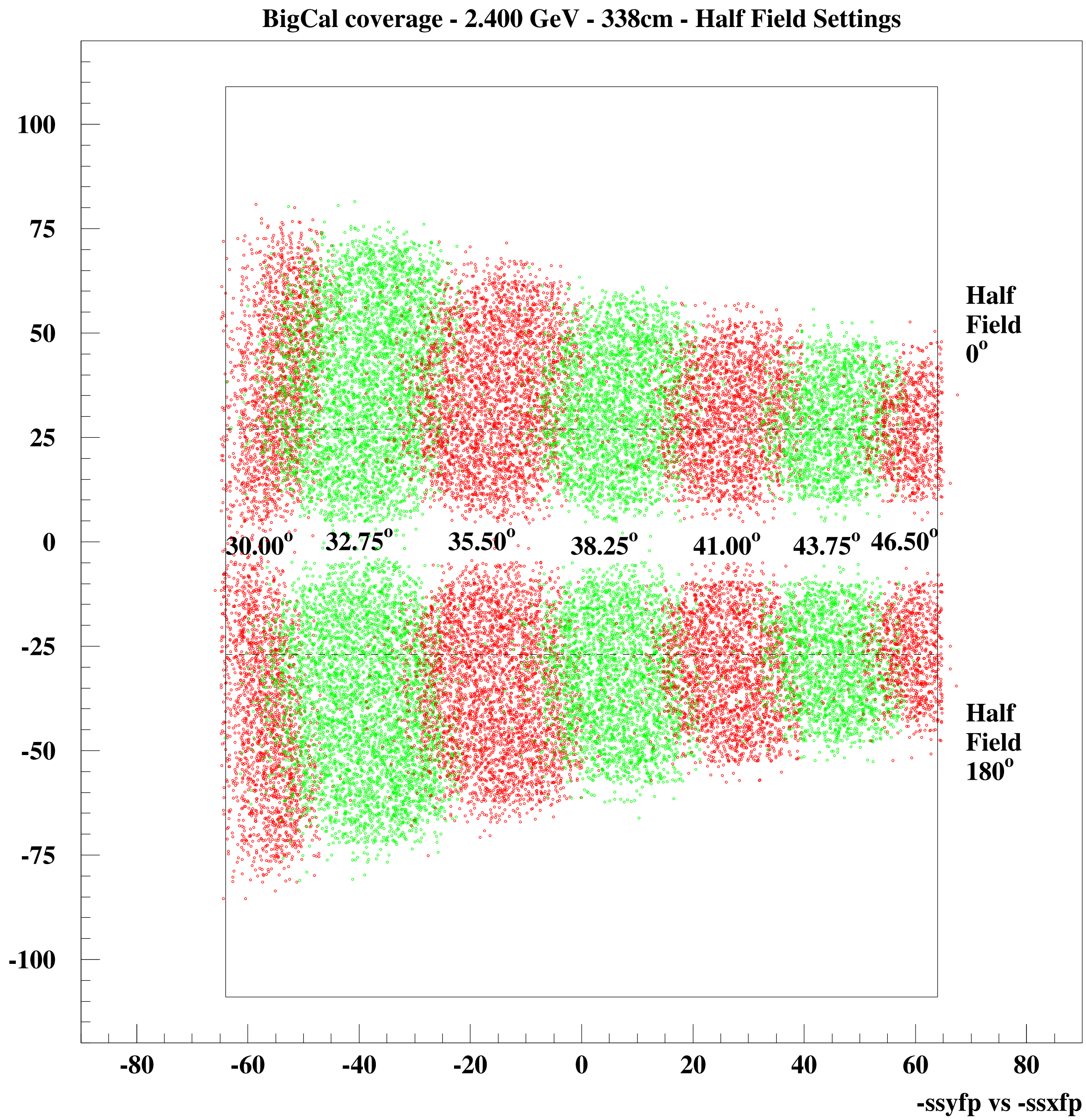
   (f) Prescale factor PS1(HMS)=1:PS2(BigCal)=100:PS3(Coin)=1.

2. **ep coincidence runs ⇒ 3.5 hrs (@100% efficiency)**

   Take one run for each of the following HMS momentum and angle settings. The scattered electron energy and angle on the BigCal are given for reference only. Note that the event estimate is for hydrogen elastics only, and does not include π^0 events and quasi-elastics from Nitrogen.

   Also note that this ordering is non-optimal in that the HMS quads will need 100A cycling for each setting. This cycling will take 15-30 min per setting. This ordering was chosen, nonetheless, because it allows the high rate runs to be completed before the low rate runs.

P_{HMS}	θ_{HMS}	E'_e	$\theta_{e'}$	Elastics/run	Elastics/cell	Time (@100% eff)	(@80% eff)
1.233	46.50	1.789	30	9k	400	13 min.	16 min.
1.334	43.75	1.706	33	18k	400	17 min.	21 min.
1.443	41.00	1.617	36	21k	400	30 min.	38 min.
1.555	38.25	1.522	39	13k	200	28 min.	35 min.
1.670	35.50	1.423	43	17k	200	51 min.	64 min.
1.789	32.75	1.318	47	10k	100	60 min.	75 min.


BigCal coverage - 2.400 GeV - 338cm - Half Field Settings
100
75
50
25
0
-25
-50
-75
-100
-80
-60
-40
-20
0
20
40
60
80
-ssyfp vs -ssxfp
30.00°
32.75°
35.50°
38.25°
41.00°
43.75°
46.50°
Half Field 0°
Half Field 180°

Full Field, 0^o Calibration Runs

1. Set up the following configuration:

    (a) Target field ramped to 5.0033 Tesla, 0^o orientation, unpolarized. Check field sign.

    (b) 1 μA beam, 1 cm slow raster, centered on target.

    (c) Set HMS for a momentum of 1.233 GeV/c, magnets properly cycled.

    (d) While setting the HMS momentum, record ADC gains for all BigCal blocks illuminated with the Gain Monitor light (15 min) and make HV adjustments to bring the ADC values back to their reference (zero field) values. Repeat gain monitor if needed. Record these HV values as they will be needed later.

    (e) HMS pion collimator.

    (f) Prescale factor PS1(HMS)=1:PS2(BigCal)=100:PS3(Coin)=1.

2. **ep coincidence runs ⇒ 10 hrs (@100% efficiency)**

    Take one run for each of the following HMS momentum and angle settings. The scattered electron energy and angle on the BigCal are given for reference only. Note that the event estimate is for hydrogen elastics only, and does not include π^0 events and quasi-elastics from Nitrogen.

P_{HMS}	θ_{HMS}	E'_e	$\theta_{e'}$	Elastics/run	Elastics/cell	Time (@100% eff)	(@80% eff)
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1.443	41.00	1.617	36	24k	400	32 min.	40 min.
1.555	38.25	1.522	39	29k	400	60 min.	75 min.
1.670	35.50	1.423	43	37k	400	107 min.	134 min.
1.789	32.75	1.318	47	22k	200	122 min.	153 min.
1.907	30.00	1.213	50	8k	100	227 min.	284 min.

Half Field, 180^o Calibration Runs

1. Set up the following configuration:
   (a) Request a hall access to reverse lead polarity at target PS.
   (b) Target field ramped to 2.5016 Tesla, 180^o orientation, unpolarized. Check field sign.
   (c) 1 μA beam, 1 cm slow raster, centered on target.
   (d) Set HMS for a momentum of 1.233 GeV/c, magnets properly cycled.
   (e) While setting the HMS momentum, record ADC gains for all BigCal blocks illuminated with the Gain Monitor light (15 min) and make HV adjustments to bring the ADC values back to their reference (zero field) values. Repeat gain monitor if needed. Record these HV values as they will be needed later.
   (f) HMS pion collimator.
   (g) Prescale factor PS1(HMS)=1:PS2(BigCal)=100:PS3(Coin)=1.

2. **ep coincidence runs $\Rightarrow$ 3.5 hrs (@100% efficiency)**

   Take one run for each of the following HMS momentum and angle settings. The scattered electron energy and angle on the BigCal are given for reference only. Note that the event estimate is for hydrogen elastics only, and does not include π^0 events and quasi-elastics from Nitrogen.

   Also note that this ordering is non-optimal in that the HMS quads will need 100A cycling for each setting. This cycling will take 15-30 min per setting. This ordering was chosen, nonetheless, because it allows the high rate runs to be completed before the low rate runs.

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1.555	38.25	1.522	39	13k	200	28 min.	35 min.
1.670	35.50	1.423	43	17k	200	51 min.	64 min.
1.789	32.75	1.318	47	10k	100	58 min.	73 min.

Full Field, 180^o Calibration Runs

1. Set up the following configuration:
   (a) Target field ramped to 5.0033 Tesla, 180^o orientation, unpolarized. Check field sign.
   (b) 1 μA beam, 1 cm slow raster, centered on target.
   (c) Set HMS for a momentum of 1.233 GeV/c, magnets properly cycled.
   (d) While setting the HMS momentum, do one of the following:
      - If the BigCAL PMT gains have been shown to be sensitive to the target field polarity, record ADC gains for all BigCal blocks illuminated with the Gain Monitor light (15 min) and make HV adjustments to bring the ADC values back to their reference (zero field) values. Repeat gain monitor if needed. Record these HV values as they will be needed later.
      - If the BigCAL PMT gains have been shown to not be sensitive to the target field polarity, set the HV to the values used in the full field 0^o calibration runs.
   (e) HMS pion collimator.
   (f) Prescale factor PS1(HMS)=1:PS2(BigCal)=100:PS3(Coin)=1.

2. **ep coincidence runs ⇒ 10 hrs (@100% efficiency)**

   Take one run for each of the following HMS momentum and angle settings. The scattered electron energy and angle on the BigCal are given for reference only. Note that the event estimate is for hydrogen elastics only, and does not include π^0 events and quasi-elastics from Nitrogen.

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1.670	35.50	1.423	43	37k	400	107 min.	134 min.
1.789	32.75	1.318	47	22k	200	120 min.	150 min.
1.907	30.00	1.213	50	8k	100	225 min.	281 min.