

$x > 1$ and EMC Effect (XEM2) Run Plan

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0.1 SHMS 10 deg and HMS 35 deg - Target Ladder I

- In this section, we will take data with the SHMS and HMS simultaneously in the single arm mode using a subset of targets on the target ladder I.
- While the SHMS and HMS angles will be kept fixed (at different values), the HMS will be configured to several different momentum settings. Please follow the tables below in the order written.
- Set **SHMS momentum** to **-9.2 GeV**.
- Set **HMS momentum** to **-4.08 GeV**.
- Set **SHMS angle**: **10°**
- Set **HMS angle**: **35°**
- SHMS should have HV for S1X paddles 1-5 and S2X paddles 1-6 TURNED OFF for all settings
- Estimated run times are with 100% efficiency.

0.1.1 Setting 1 - part 1 (SHMS: ELCLEAN, some paddles off, all preshower ON)

- Set HMS momentum to -4.08 GeV.
- SHMS momentum: -9.2 GeV.
- SHMS angle: 10° HMS angle: 35°
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 1 should be set to -1.
- **Prescale values are only estimated; adjust them on both SHMS and HMS Prescale GUIs accordingly to keep the rates below 5 kHz.**
- Follow Table 1. Take data with the SHMS and HMS simultaneously.
- SHMS should have HV for S1X paddles 1-5 and S2X paddles 1-6 TURNED OFF for all settings
- Estimated run times are with 100% efficiency. **FOR THIS SETTING, STOP AT 120% OF THE ESTIMATED TIME, EVEN IF THE TARGET ELECTRON NUMBER IS NOT YET REACHED.**

Table 1: High- Q^2 EMC (and scaling studies) at 35° - Setting 1

Target	I (μ A)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	7 hrs	1400	
LH2	60	-1	0	-1	0	0.5 hr	-	yes
Al dummy	40	-1	0	-1	0	2.5 hrs	-	yes
40Ca	60	-1	0	-1	0	5 hrs	1000	yes
40Ca	60	0	-1	0	-1	30 min	-	yes
12C	60	0	-1	0	-1	30 min	-	yes
12C	60	-1	0	-1	0	10 hrs	700	yes

0.1.2 Setting 1 - part 2 (SHMS: ELCLEAN, some paddles off, some preshower off)

- **HMS momentum: -4.08 GeV.**
- **SHMS momentum: -9.2 GeV.**
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 2 should be set to **-1**.
- **Prescale values are only estimated; adjust them on both SHMS and HMS Prescale GUIs accordingly to keep the rates below 5 kHz.**
- Follow Table 2. Take data with the SHMS and HMS simultaneously.
- SHMS should have HV for S1X paddles 1-5 and S2X paddles 1-6 **TURNE**D OFF for all settings
- SHMS should have HV for SHMS Preshower blocks 1-6 (+ and -) **TURNE**D OFF
- Estimated run times are with 100% efficiency. **FOR THIS SETTING, STOP AT 120% OF THE ESTIMATED TIME, EVEN IF THE TARGET ELECTRON NUMBER IS NOT YET REACHED.**

Table 2: High- Q^2 EMC (and scaling studies) at 35° - Setting 1

Target	I (μ A)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	13 hrs	2700	
LH2	60	-1	0	-1	0	0.5 hr	-	
Al dummy	40	-1	0	-1	0	2.5 hrs	-	
40Ca	60	-1	0	-1	0	5 hrs	1000	
40Ca	60	0	-1	0	-1	20 min	-	
12C	60	0	-1	0	-1	20 min	-	
12C	60	-1	0	-1	0	2 hrs	700	

0.1.3 Setting 1 - SPECIAL TESTS

Test runs to be performed with the SHMS while continuing with normal HMS data taking on setting 1. This can be done for any run except LH2 or the two short ELREAL settings

- ALL runs use ELCLEAN
- ALL runs have HV OFF for S1X channels 1-5 and S2X 1-6
- Preshower changes done with the HV GUI
- Changing 3/4 to 4/4 requires changing trigger module

Goal is to take 6 short runs; please note the pTRIG3 rate from the scalars on the runsheet when beam is at maximum current. A table with pTRIG3 rates vs. configuration should be entered in the ELOG.

1. 10 minute run in the default SHMS configuration (ELCLEAN, S1X 1-5 and S2X 1-6 HV OFF)
2. 10 minute run with PRESHOWER blocks 1-5 (left and right) turned off
3. 10 minute run with PRESHOWER blocks 1-6 (left and right) turned off
4. 10 minute run - ELCLEAN with 3/4 changed to 4/4, and PRESHOWER 1-6 (left and right) still turned off
5. 10 minute run - ELCLEAN with 3/4 still set to 4/4, all preshower blocks ON
6. 10 minute run - ELCLEAN back to 3/4, all preshower ON (duplicate of first run)

0.1.4 Setting 2

- Set **HMS momentum** to **-3.57 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 3 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 3. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 3: High- Q^2 EMC (and scaling studies) at 35° - Setting 2

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	2 hrs	12k	
LH2	60	-1	0	-1	0	1 hr	5.5k	
Al dummy	40	-1	0	-1	0	0.5 hrs	2k	
9Be	60	-1	0	-1	0	4 hrs	16k	
40Ca	60	-1	0	-1	0	5 hrs	16k	
40Ca	60	0	-1	0	-1	20 min	-	
12C	60	0	-1	0	-1	20 min	-	
12C	60	-1	0	-1	0	5 hrs	10k	
LD2	60	-1	0	-1	0	2 hrs	12k	
LH2	60	-1	0	-1	0	1 hr	5.5k	
Al dummy	40	-1	0	-1	0	0.5 hrs	2k	
9Be	60	-1	0	-1	0	4 hrs	16k	
40Ca	60	-1	0	-1	0	5 hrs	16k	
40Ca	60	0	-1	0	-1	20 min	-	
12C	60	0	-1	0	-1	20 min	-	
12C	60	-1	0	-1	0	5 hrs	10k	

0.1.5 Setting 3

- Set **HMS momentum** to **-3.09 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 4 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 4. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 4: High- Q^2 EMC (and scaling studies) at 35° - Setting 3

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
12C	60	-1	0	-1	0	8 hrs	120k	
12C	60	0	-1	0	-1	15 min	-	
40Ca	60	0	-1	0	-1	15min	-	
40Ca	60	-1	0	-1	0	8 hrs	180k	
9Be	60	-1	0	-1	0	6.4 hrs	180k	
Al dummy	40	-1	0	-1	0	1.0 hrs	130k	
LH2	60	-1	0	-1	0	4 hrs	380k	
LD2	60	-1	0	-1	0	4 hrs	800k	

0.1.6 Setting 4

- Set **HMS momentum** to **-2.72 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 5 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 5. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 5: High- Q^2 EMC (and scaling studies) at 35° - Setting 4

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	2.6 hrs	400k	
LH2	60	-1	0	-1	0	2.6 hrs	180k	
Al dummy	40	-1	0	-1	0	0.6 hrs	80k	
9Be	60	-1	0	-1	0	4.6 hrs	400k	
40Ca	60	-1	0	-1	0	6 hrs	400k	
40Ca	60	0	-1	0	-1	10 min	-	
12C	60	0	-1	0	-1	10 min	-	
12C	60	-1	0	-1	0	6 hrs	280k	

0.1.7 Setting 5

- Set **HMS momentum** to **-2.40 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 6 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 6. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 6: High- Q^2 EMC (and scaling studies) at 35° - Setting 5

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	0.8 hrs	250k	
LH2	60	-1	0	-1	0	1.8 hrs	250k	
Al dummy	40	-1	0	-1	0	20 min	25k	
9Be	60	-1	0	-1	0	1.4 hrs	250k	
40Ca	60	-1	0	-1	0	1.8 hrs	250k	
40Ca	60	0	-1	0	-1	10 min	-	
12C	60	0	-1	0	-1	10 min	-	
12C	60	-1	0	-1	0	1.9 hrs	170k	

0.1.8 Setting 6

- Set **HMS momentum** to **-2.11 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 7 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 7. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 7: High- Q^2 EMC (and scaling studies) at 35° - Setting 6

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	25 min	190k	
LH2	60	-1	0	-1	0	50 min	190k	
Al dummy	40	-1	0	-1	0	15 min	30k	
9Be	60	-1	0	-1	0	45 min	180k	
40Ca	60	-1	0	-1	0	50 min	180k	
40Ca	60	0	-1	0	-1	10 min	-	
12C	60	0	-1	0	-1	10 min	-	
12C	60	-1	0	-1	0	80 min	180k	

0.1.9 Setting 7

- Set **HMS momentum** to **-1.85 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 8 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 8. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 8: High- Q^2 EMC (and scaling studies) at 35° - Setting 7

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	30 min	145k	
LH2	60	-1	0	-1	0	30 min	145k	
Al dummy	40	-1	0	-1	0	10 min	25k	
9Be	60	-1	0	-1	0	30 min	145k	
40Ca	60	-1	0	-1	0	30 min	145k	
40Ca	60	0	-1	0	-1	10 min	-	
12C	60	0	-1	0	-1	10 min	-	
12C	60	-1	0	-1	0	45 min	145k	

0.1.10 Setting 8

- Set **HMS momentum** to **-1.63 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 9 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 9. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 9: High- Q^2 EMC (and scaling studies) at 35° - Setting 8

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	25 min	110k	
LD2	60	0	-1	0	-1	5 min	-	
LH2	60	0	-1	0	-1	5 min	-	
LH2	60	-1	0	-1	0	40 min	110k	
Al dummy	40	-1	0	-1	0	10 min	20k	
Al dummy	40	0	-1	0	-1	5 min	-	
9Be	60	-1	0	-1	0	40 min	110k	
40Ca	60	-1	0	-1	0	40 min	110k	
40Ca	60	0	-1	0	-1	5 min	-	
12C	60	0	-1	0	-1	5 min	-	
12C	60	-1	0	-1	0	30 min	110k	

0.1.11 Setting 9

- Set **HMS momentum** to **-1.44 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 10 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 10. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 10: High- Q^2 EMC (and scaling studies) at 35° - Setting 9

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	-1	0	-1	0	60 min	95k	
LD2	60	0	-1	0	-1	5 min	-	
LH2	60	0	-1	0	-1	5 min	-	
LH2	60	-1	0	-1	0	45 min	95k	
Al dummy	40	-1	0	-1	0	15 min	15k	
Al dummy	40	0	-1	0	-1	5 min	-	
9Be	60	-1	0	-1	0	40 min	95k	
40Ca	60	-1	0	-1	0	40 min	95k	
40Ca	60	0	-1	0	-1	5 min	-	
12C	60	0	-1	0	-1	5 min	-	
12C	60	-1	0	-1	0	45 min	95k	

0.1.12 Setting 10

- Set **HMS momentum** to **-1.26 GeV**.
- **SHMS momentum: -9.2 GeV**.
- **SHMS angle: 10°** **HMS angle: 35°**
- **Trigger:** HMS is PS2(ELREAL) or PS1(3/4); SHMS is PS3(ELCLEAN) or PS2(ELREAL)
- **Important note on the prescales:** All the other prescales that are NOT specified on each row at the Table 11 should be set to **-1**.
- Prescale values are only estimated; Use the lowest prescale values that keep the trigger rate in the **HMS near or below 4 kHz** and the **SHMS near or below 8kHz**
- SHMS should have HV for S1X paddles 1-5, S2X paddles 1-6, and preshower blocks 1-6 (+ and -) **TURNED OFF** for all settings
- Follow Table 11. Take data with the SHMS and HMS simultaneously.
- Estimated run times are with 100% efficiency.

Table 11: High- Q^2 EMC (and scaling studies) at 35° - Setting 10

Target	I (μA)	HMS PS		SHMS PS		Est. Time	Target e^-	Done ?
		PS1	PS2	PS2	PS3			
LD2	60	5	-1	5	-1	5 min	-	
LD2	60	-1	5	-1	5	80 min	75K	
LH2	60	-1	3	-1	3	50 min	75K	
LH2	60	3	-1	3	-1	5 min	-	
Al dummy	40	1	-1	1	-1	20 min	12K	
Al dummy	40	-1	1	-1	1	5 min	-	
9Be	60	-1	2	-1	2	5 min	-	
9Be	60	3	-1	3	-1	50 min	75K	
40Ca	60	3	-1	3	-1	50 min	75K	
40Ca	60	-1	2	-1	2	5 min	-	
12C	60	-1	2	-1	2	5 min	-	
12C	60	2	-1	2	-1	45 min	75K	