**NH3 target**: loaded & first (long.) polarization & magnet commissioned

All **detectors installed**, including beam telescope FI01, VI01 & FI15, FI04, VI02, FI03

**Trigger** commissioned

---

**This week: getting ready for Drell Yan 2018 physics**

<table>
<thead>
<tr>
<th></th>
<th>Friday May 4</th>
<th>Saturday May 5</th>
<th>Sunday May 6</th>
<th>Monday May 7</th>
<th>Tuesday May 8</th>
<th>Wednesday May 9</th>
<th>Thursday May 10</th>
<th>Friday May 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>units on T6</td>
<td>80 ➝100</td>
<td>100</td>
<td>100</td>
<td>100 ➝120</td>
<td>120</td>
<td>120</td>
<td>120</td>
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<tr>
<td>main topic</td>
<td>FI03 / FI04</td>
<td>wire chamber</td>
<td>wire chamber</td>
<td>Li absorber</td>
<td>Li absorber</td>
<td>Li absorber</td>
<td>Move chicane &amp; goto dipole</td>
<td>Beam steering</td>
</tr>
<tr>
<td></td>
<td>threshold</td>
<td>plateaus @180,500mm</td>
<td>plateaus @ 40,500mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>others</td>
<td></td>
<td>Survey FI01, FI04, RW &amp; MW1 interventions, alignment w/o solenoid</td>
<td>PA01* intervention</td>
<td>move chicane &amp; goto dipole DC4 intervention</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>target</td>
<td>trim coil setting check, field</td>
<td>solenoid</td>
<td>solenoid</td>
<td>solenoid</td>
<td>solenoid OFF during day, ON evening &amp; start polarizing</td>
<td>polarizing</td>
<td>dipole ON</td>
<td>dipole</td>
</tr>
</tbody>
</table>

MD will only be 4 hours long (8-12h)
Plateau scans 2018 at 100 units on T6

Drift chambers DC0, DC1, DC4, DC5
Micromegas, Straw ST03

Task (for shift): take data at different, well-defined HV Goal (for experts): efficiency vs. HV (offline)

Note: In the DC0, DC1X, DC1Y, and DC1Z drifts are OFF because they are connected to HV splitters. IT drifts and JU drifts. They'll test appear in the DC1 Efficiency table.

Note: All other planes at 1640/1780 V (6mm/10mm), DO NOT change 03U1_10mm_1

Note: The DC0, DC1, DC4, and DC5 1675. DC5X=1650. Keep BK as they are

Note: All other places at 1620/1750 V. Drifts 1X, 1Y, 1Z, and 2X are at 1420 V, 2X - 1220 V
**Plateaus scans 2018 at 100 units on T6**

Drift chambers DC0, DC1, DC4, DC5

Micromegas, Straw ST03

---

**example: block #1**

<table>
<thead>
<tr>
<th>Action</th>
<th>No</th>
<th>DC0X Pl</th>
<th>DC0X Wr</th>
<th>DC1Y Pl</th>
<th>DC1Y Wr</th>
<th>DC4U Pl</th>
<th>DC4U Wr</th>
<th>DC5V Pl</th>
<th>DC5V Wr</th>
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<tbody>
<tr>
<td>Run</td>
<td>1</td>
<td>1675</td>
<td>1675</td>
<td>1675</td>
<td>1675</td>
<td>1675</td>
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<tr>
<td>Run</td>
<td>2</td>
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<td>1675</td>
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<tr>
<td>Run</td>
<td>3</td>
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<tr>
<td>Run</td>
<td>4</td>
<td>1600</td>
<td>1600</td>
<td>1600</td>
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<td>1600</td>
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<tr>
<td>Run</td>
<td>5</td>
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<td>Run</td>
<td>9</td>
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<td>1675</td>
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</tr>
</tbody>
</table>

Note: All other planes at 320/620/920/1420; Dri1s 1X, 1Y, 3U and 3V always at 1420 V, 2X = 1320 V.

---

**resulting run numbers**

---

**ST03Y1_6mm**

<table>
<thead>
<tr>
<th>DC0X Pl</th>
<th>DC0X Wr</th>
<th>DC1Y Pl</th>
<th>DC1Y Wr</th>
<th>DC4U Pl</th>
<th>DC4U Wr</th>
<th>DC5V Pl</th>
<th>DC5V Wr</th>
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</thead>
<tbody>
<tr>
<td>1640</td>
<td>1780</td>
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</tr>
</tbody>
</table>

---

**ST03Y1_10mm**

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**ST03Y2_6mm**

---

**ST03Y2_10mm**

---

**PMM and DC MEASUREMENTS 2018 - Table must be checked for 2018 before using it !!!!
Lithium tests @ 120 units on T6 & 500mm target & solenoid ON & chicane not moved

<table>
<thead>
<tr>
<th>config</th>
<th>dates 2018</th>
<th>changes before installation</th>
<th>run numbers</th>
<th>L1</th>
<th>L1*</th>
<th>L2</th>
<th>PE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>April 19 - May 8</td>
<td></td>
<td><em>Before BMS removal:</em> 282890 (179), 282891 (13), 282892 (56), 282893 (200), 282894 (200), 282896 (200), 282897 (200), 282898 (200), 282899 (200), 282900 (104), 282901 (10), 282902 (19), 282903 (147), 282919 (9), 282920 (72)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>May 8, 11:30-18:00</td>
<td>DC4 fix, solenoid OFF</td>
<td>282925 (200), 282926 (200), 282927 (200)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>May 8, 18:00 - May 9, 10:00</td>
<td>solenoid on</td>
<td>282938 (91), 282939 (200), 282940 (200), 282941 (200)</td>
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<tr>
<td>4</td>
<td>May 9, 10:00 - May 10, 10:00</td>
<td></td>
<td>282971 (200), 282972 (21), 282973 (200), 282974 (26), 282975 (200)</td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>May 10, 10:00 - …</td>
<td>No DC4 (garage) bad DC5</td>
<td>282991 (200), 282992 (200), 282993 (200)</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

Planning:
- Thursday morning (backup: Thursday afternoon):
  - remove (L2 & L1*), add L1, L2, PE

282926: bad beam extraction (only beginning)
282925, 282926: no RW
282974, 282975: no SciFi15U
282991-282993: no DC4, wrong threshold DC5
Units on T6 & DC0X wire current vs. time

- Plateau 180mm alignment
- Plateau 500mm
- Plateau 500mm
- Plateau 40mm
- BA2 cooling prob
- DC5 thresh
- BLM prob
- first nominal DY intensity & DY trigger
- adjust FI01 & FI15 positions; survey FI03, FI01, FI15
- no beam from PS
- DC5 thresh
- MD
- access for DC4 & lithium
- lithium #1
- lithium #2
- lithium #3
- lithium #4
- lithium #5
- PRM runs with muons

C.Riedl

Weekly Report - Drell Yan 2018 - May 11, 2018
Drell-Yan data taking

- Chicane moved Thursday evening
- Target magnet: solenoid to dipole Thursday evening
- Beam file with chicane
- First Drell-Yan events with pion beam & transverse target polarization Thursday night!
- Friday morning: beam tuning (Johannes)
C.Riedl

Weekly Report - Drell Yan 2018 - May 11, 2018

- **long-term solenoid test**
  - solenoid current
  - dipole current

- **field rotation test**

- **polarization**
  - downstream
  - upstream

- **Table**
<table>
<thead>
<tr>
<th></th>
<th>upstream</th>
<th>downstream</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015 A</td>
<td>-73.5 %</td>
<td>+73.2 %</td>
</tr>
<tr>
<td>in 26</td>
<td>hours</td>
<td></td>
</tr>
<tr>
<td>2015 B</td>
<td>+75.3 %</td>
<td>-72.2 %</td>
</tr>
<tr>
<td>in 26</td>
<td>hours</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>+75.0 %</td>
<td>-79.4 %</td>
</tr>
<tr>
<td>in 26</td>
<td>hours</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>-77.0 %</td>
<td>+76.8 %</td>
</tr>
<tr>
<td>in 20</td>
<td>hours</td>
<td></td>
</tr>
</tbody>
</table>

- **SciFi work**
  - polarization off for SciFi work

- **Physics**
  - polarization for physics

- **Currents**
  - solenoid current
  - dipole current

- **Graphs**
  - field rotation test
  - polarization downstream
  - polarization upstream
Field rotation & polarization loss with old new SMC procedure

- **Solenoid current**
- **Dipole current**
- **Downstream polarization**
- **Upstream polarization**

**New procedure test result**

- 0.50 % loss in 2015 from sol. to dip. (from dip. to sol.) with trim coils OFF
- < 0.10 % loss with trim coils ON oppositely in 2018 (new procedure)
Dispersion between NMR coils 2018

upstream

-89.12%

-74.22%

NMR coil

Outside

2018

1 2 3 4 5 6 7 8 9 10

NMR coil location in 2015

downstream

+78.17%

+84.42%
Problems & interventions

- Actually not too many: some noisy channels here and there or missing planes, usually fixed quickly

- **ST03:**
  - Tripping HV channels
  - 2 ports cause oscillations in LV of 3rd port. 2 cards identified, but difficult to access and water cooled. Delay intervention until next long MD. For the time being, the 2 ports are excluded.
  - May 2: attempt to exchange very warm Normabarre connector (and fan unit) causes power cut on Jura side. Culprit might have been cable that provides power to the fan unit.

- **PA01* (PS01) intervention:** catch problem can be solved without pulling chamber in garage

- **DC4** readout: regularly disappearing ports due to connector, cable, **card**?
  Recently super successful: exchange of F1 card. 2x May 10.

- Have to keep a close look at cooling water in 888
Notes

• Since May 9: new 22Na source for the random trigger: true random trigger rate increased from 10k to 160k

• Integrated radiation dose of environmental monitor: to be published in DCS (by Christophe)

• 18T02: runs 282180-282943

• Period 18W01 runs 292944++
Preparation of COMPASS 2018 DY run - no change since April 6

April 2018

- April 9-15: muon beam day & night
- April 16-20 & 25-27: muon beam with multiple interruptions due to target loading & COMPASS installations; beam in the night
- April 28++ hadron beam day & night with increasing intensity + muon beam at certain times

(*) defined as “FIs installed + 2 weeks”

<table>
<thead>
<tr>
<th>target loading</th>
<th>physics (*)</th>
<th>reason for change</th>
</tr>
</thead>
<tbody>
<tr>
<td>current</td>
<td>April 17</td>
<td>May 14 (or earlier)</td>
</tr>
<tr>
<td>Bonn March 22</td>
<td>April 24</td>
<td>May 21</td>
</tr>
<tr>
<td>TB February 20</td>
<td>April 17</td>
<td>May 14</td>
</tr>
<tr>
<td>CM January 25</td>
<td>April 17</td>
<td>May 14</td>
</tr>
<tr>
<td>TB December 4</td>
<td>May 8</td>
<td>June 4</td>
</tr>
<tr>
<td>perfect world schedule</td>
<td>March 27</td>
<td>April 23</td>
</tr>
</tbody>
</table>
Detector experts:

- Check settings in DCS - deviations from reference?
- Continue your tireless work on MurphyTV errors.
- Update cool references at 120 units and 500mm!

Thanks to all shifters, experts, and coordinators!

Good luck Annika!

Drell Yan 2018
Detailed info & day-by-day
Friday May 4 - solenoid ON

• Reduce 100mm target to 40mm target with pion beam, 50 units on T6, increasing

• 13:30 access for mu-metal of FI15, and for ST03 (cables 26 & 29, cards are difficult to access)

• 14:30 **target magnet: field rotation** solenoid+ —> dipole+ —> solenoid+
  (2x because 1st time there was problem with trim coils & Sylvain had to be called)
  Result: better than 2015. Reminder: new-old SMC procedure

• 15:00 increase of intensity to 100 units on T6

• 18:00 -23:00 muon alignment beam for **SciFi threshold scans (FI01, FI15, FI03, FI04)**
Saturday May 5 - solenoid ON

- Go to thicker target:
  < midnight: 40mm target
  midnight: 500mm, radiation alarm (DCS & acoustic) at around 3 muSv/hour on PAXN2112
  0:25: 100mm, no alarm
  0:45: 300mm, alarm
  1:20: 180mm, no alarm: stay there

- Saturday afternoon: contacted (by e-mail) Johannes and Dipanwita (EN-EA) and RP

- Plateau scans @ 180mm for DC0/1/4/5, MM5, ST03: 2:00 - 4:30 & 6:00-9:13, 47 runs of each 20 spills (4:30-6:00 no beam)

- Alignment runs mu- (SM1 & SM2 ON then OFF)

- RP updates the upper limits in 888. We can go to 500mm target @ ~105 units on T6 without alarm.

- Plateau scans @ 500mm target
  
  - Trip of ST03Y2 6mm, can be raised in steps and with very slow ramp-up speed
  
  - Over current in DC05X DCS alarm, unclear why, turned off and later on again without problem. Trip later in the night. Probably related to too low trip limit.
  
  - DC01V noise, had appeared some days ago. To be fixed.
Sunday May 6 - solenoid ON

- **Plateau scans @ 500mm with DC5-X** not ramped higher than 1600
- **DC5V threshold scan**
- **9:30-15:15 no beam due to BLM**
- **Continue DC5 threshold scan**
- **Plateau scans @ 40mm**
- **Plateau scans @ 500mm**, “missing runs”

- **DC00U1** missing 257/11 (fixed by access) and 257/14
- **DC5X-plane trip**: have to decrease HV to 1600V. Raising the trip limit from 10uA to 60uA solves the problem of over current and trips.
- **ST03V1** noise returns
- **ST03Y2 6mm** trips
- **MW1**: MA01Y4, MA01Y3, MA02X1 noisy
- **SciFi15** SRCids 130 + 23 missing, X1/X2/Y1 affected; fixed by Johannes G. Sunday morning after phone call with Rainer (powercycling of module)
- **W45** noisy channels
Monday to Tuesday

multiplicity veto tuning
BMS removal
air target
Monday May 7 - solenoid ON

- Finish plateau scans @ 500mm, “missing runs”, almost finished
- 9:00 access 30min for chicane
- 9:30 meet with Frederic Aberle from RP
- BA2 cooling problems - no beam 8:50 - 13:30
- 13:30 beam back with 108-111 units on T6
- 15:30: finish plateau scan at 500mm @ 105 units
- 17:00: access for DC4
- Switch to nominal beam intensity: 120 units & 500mm target & pion beam
- 21:15: tuning of multiplicity veto with air target (Jens)
- 2:00: remove BMS

- First DY trigger mix data were taken at 14:00

- DC04 missing 260/11
line = 120 units

RF SPS prob

lithium #2 lithium #3

MD

lithium #4
Tuesday May 8- solenoid ON / OFF

- 120 units & 500mm target & pion beam

- 6:00-8:00: DC5 threshold scan @ 40mm target

- 8:45: solenoid OFF

- 9:00: move FI01 [12 mm Saleve] & FI15; survey FI03, FI01, FI15
  Put exactly as in 2015.

- Interventions in 888:
  - RICHwall: 1.5h
  - MW1
  - W45 noise
  - DC4
  - Site visit of CV for various cooling issues
  - 11:30: removal of L1 lithium

- Lithium studies #2 @ 120 units & 500mm target

- 18:00 lithium: add PE sheet.

- 21:30 Alignment with solenoid OFF: SM1/2 OFF, then SM1/2 ON

- ~ 22:00 turn ON solenoid and start polarizing.

- ECal & HCal calibration with muon beam file at 40mm, 600 spills

- Lithium studies #3 @ 120 units & 500mm target

Remaining RED:
480, 481, 482 MW1
-> solved through reloading
432 RW
460 MWPC
MD Wednesday May 9 - solenoid ON

- 5:00 power cycle of switches in SM1 rack and on gallery
- 6:00 Bend06 faulty, SPS called
- 8:00 start of MD
- 8:30 EN-EA technicians for chicane hydraulic jacks: repair of valve & test of system, works!
- 10:00: change to lithium config #4: 2 lithium sheets at very backend of absorber, no PE.
- MW1 intervention
- PA01* (PS01) intervention: catch problem can be solved without pulling chamber in garage
- DC04 intervention at patch panel, fine later in the afternoon
- New 22Na source for the random trigger: true random trigger rate increased from 10k to 160k
- CT restored after unscheduled intervention had made it disappear
- 14:00-15:00 Tests of beam intensity (Johannes): too many losses
- 14:30: M2 beam line cooling failures of magnets
- 17:00-23:30 (17:45-21:25 no beam from PS): DC5 threshold scan

Remaining RED in MurphyTV: NONE!!
Nice!
That’s how it should be!!
Thursday May 10 - solenoid ON —> dipole

- 23:30- 2:30: Data taking with pion beam & current lithium configuration (#4) at 500mm and 120 units
- 2:30-10:00 Proton radius runs (for TPC) with 120 units muons
- 06:30 Access to reboot pccore21 (reboot engine for PRM had gotten stuck)
- 10:00: install final lithium configuration (#5)
- Intervention for DC4 readout (pulled in garage)
- 17:00: move HCal2 & ECal2 to Jura by 50cm for PRM
- 17:00-19:45: pion beam for lithium #5 configuration
- 20:00 move chicane
- 20:00 access for DC4, MWPC; move calos back to nominal position
- 20:00 turn on target dipole

since 1:40: 100% error on SciFi15 (870,852)
SCFI15U1, SCFI15U2
FI15U1 (Beam Monitor)
--> fixed by expert
BMS 240, 241, 244 missing;
powercycled crate
- Observations:
  - ST03V1 (srcID 324): noisy
  - Fluctuation of current in LV channel 7
  - Warm Normabarre connector & cable; the total power is less than 2.5kW, should not warm up the cable that much.

- May 2: attempt to exchange Normabarre connector (and fan unit) causes power cut on Jura side. Culprit might have been cable that provides power to the fan unit.

- Vincent: if port 13 of srcID 321 is excluded, the noise in ST03V1 disappears. Both ports are related to ST03U1:
  srcID = catch 321 port 10 (cable #26) & port 13 (cable #29)
  2 cards identified, but difficult to access and also water cooled. Delay intervention until next long MD. For the time being, the 2 ports are excluded and therefore there are no oscillations in the LV.

  There also seems to be correlation with HV? Noise appeared during night of threshold scan, even though the 2 ST03V1 ports were excluded, then noise disappears on its own.

- ST03Y2 6mm trips, can be very slowly ramped up again.
Cooling

• About all of the following points, Vincent is in contact with Hassane from CV.

  • Target pump room: temperature gradient, side of pumps too warm. Bad ventilation? Cooling cannot account for oscillations of temperature

  • Temperature of tap water in 888: was issue for MW cooling (EIO tube secondary cooling) April 30 & May 1, measured to be 30 C on May 1, also afterwards found to be warmer than usual (also rest rooms in 888). Bill Bannister and Hassan site visit May 2, explanation well pump (→ Vincent)

  • Cooling of BMS barrack: will get quote for improved shielding

  • Cooling unit for GEMs on Jura side not providing sufficient power? is OK now

• Planned interventions for DAQ room ACs May 16++

• NMR rack temperature (water outlet). Cooling water pump had stopped, refilled water and started again. Raw water is used for primary cooling, distilled is closed circuit. Last time filled in March. Affects polarization measurement. When cooling not sufficient, then polarization is measured to be too low. Phase transition of NMR cable.
Why a lithium absorber?

1. Spallation neutron created in hadron absorber

2. Thermalization on heavy elements (concrete blocks, steel support frames, ...)

3. Capture of thermal neutron on heavy elements

4. De-excitation of nucleus & emission of gamma

Insert neutron absorber here:
- \( n + ^6\text{Li} \rightarrow ^3\text{H} + ^4\text{He} \): stop in air, do not reach DC0
- \( n + ^{20}\text{B} \rightarrow ^{20}\text{B}^* \rightarrow ^{20}\text{B} + \gamma_{\text{500 keV}} \): reaches DC0
- Both Li and B are good in absorbing low-E neutrons

Required energy cutoff: very small (meV)
Required thermalization & capture time: very large (~50µs)
282898
(L1 - -)
119 units on T6
ion2= $2.64 \cdot 10^8$

282925
(- - -)
124 units on T6
$2.76 \cdot 10^8$

no time to finish this study during weekly coordinator shift.
uploading it like this:(
Rates per channel in DC00-X2 - 2015

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>run</td>
<td>254,473</td>
<td>258,118</td>
<td>258,183</td>
<td>258,213</td>
<td>258,283</td>
</tr>
<tr>
<td>ion2</td>
<td>3.93·10⁸</td>
<td>4.10·10⁸</td>
<td>4.17·10⁸</td>
<td>4.59·10⁸</td>
<td>4.80·10⁸</td>
</tr>
<tr>
<td>config</td>
<td>( - - - )</td>
<td>(L1 L2 - )</td>
<td>(L1 - - )</td>
<td>(L1 - P)</td>
<td>(L1 L2 P)</td>
</tr>
<tr>
<td>peak rate / ch [10³ kHz]</td>
<td>0.7</td>
<td>0.9</td>
<td>0.6</td>
<td>0.9</td>
<td>0.8</td>
</tr>
</tbody>
</table>

- Observation ①: after removal of lithium-2, decrease of rate by 50% (@ ~ same beam intensity)
- Observation ②: after adding polyethylene, increase of rate by 50% (@ 10% higher beam intensity)
- Observation ③: after adding lithium-2, decrease of rate by 30% (@ 5% higher beam intensity)
- BUT be careful with the interpretation…
  - A low rate / channel can be due to inefficiencies because too many particles are present.
  - A high rate / channel can mean there are many (unshielded) particles.
Target preparations in more detail.

- **Warm up magnet 4K to 80K for target loading**: 5 days
- **Monday, 1 day**
- **Prepare LN2 bath and loading tools**: Tuesday, 1 day
- **Fill target cells & insert into mixing chamber**: Wednesday / Thursday, 2 days (with cleaning)
- **Friday, 1 day**
- **Remove target-loading platform**: 4 days - no beam
- **First TE calibration**
- **Target commissioning**
- **Check of DR in 3He mode**
- **Polarization with MW**
- **Homogeneity of B-field**
- **Iterated TE calibration (?)**
- **Check of max. polarization**
- **Spectrometer commissioning with BT**
- **Beam Telescope (BT) installation**
- **Start physics**
Improved shielding for COMPASS 2018 run

- Improvement of shielding for better radio protection at intensity $10^8$ pions / second
- Simulation with FLUKA (A. Maggiora)
- Exploiting massive parallel computing resources of Blue Waters.

Improvement of PLC shielding to reduce the risk of SEEs (Single Event Effects).
2015: 9 SEEs during magnet operation, each causing ~48h loss

- New balcony shielding
- Improved shielding for COMPASS 2018 run

- Concrete 80cm = factor 10 reduction in (high-energy) neutron flux, factor 3 thermal neutrons
- Polyethylene ~2cm to thermalize neutrons
- Boron-carbid sheet to absorb thermal neutrons (measured to be main source of radiation at PLC location)