Welcome to bi-weekly Heavy Flavor Topical Group meeting

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General Information

- MDC1 analysis on going: more in Cameron's talk
  - https://wiki.bnl.gov/sPHENIX/index.php/Heavy_Flavor_Topical_Group_Mock_Data_Challenge_1
  - Thanks to all the nice studies done so far: Zhaozhong Shi (MIT), Ming Liu (LANL), Han sheng Li (Purdue), Sourav Tarafdar (Vanderbilt), Sebastian Tapia Araya (ISU), Dan Lis (UColorado)
  - First set of plot as public note sPH-HF-2021-001: https://indico.bnl.gov/event/11336/
- Full list of topics: https://wiki.bnl.gov/sPHENIX/index.php/Heavy_Flavor_Topical_Group#Study_plans
- Recent HFTG status reports:
  - Hugo Pereira da Costa at APS GHP (Apr. 13 16, 2021): https://indico.jlab.org/event/412
  - 10th sPHENIX Collaboration Meeting : https://indico.bnl.gov/event/10568/
  - BUP (sPH-TRG-2020-001): https://indico.bnl.gov/event/9301/
- Upcoming conference
  - Yasser will give plenary talk SQM 2021 (May 17 22): https://indico.cern.ch/event/985652/

MatterMost

- **Lots of discussions are ongoing on Mattermost!** Please join the topics you are interested in. We can also create a new group if your topic is not there yet.
  - MDC1: https://chat.sdcc.bnl.gov/sphenix/channels/hf-mdc1
  - Lc: https://chat.sdcc.bnl.gov/sphenix/channels/hf-lc
  - HF triggering : https://chat.sdcc.bnl.gov/sphenix/channels/hf-track-trigger
  - HF jet track counting tagger: https://chat.sdcc.bnl.gov/sphenix/channels/hf-jet-tc-tagger
  - D^0: https://chat.sdcc.bnl.gov/sphenix/channels/hf-d0
  - Bs: https://chat.sdcc.bnl.gov/sphenix/channels/hf-bs
  - D-D correlation: https://chat.sdcc.bnl.gov/sphenix/channels/hf-d0d0
  - KFParticle: https://chat.sdcc.bnl.gov/sphenix/channels/kfparticle
  - (related) Tracking software: https://chat.sdcc.bnl.gov/sphenix/channels/tracking-software
  - (related) Tracking QA: https://chat.sdcc.bnl.gov/sphenix/channels/tracking-qa

MDC1 sample need some fix

- Sebastian and Cameron pointed out the truth tracing was recently broken after tracking team updated the tracker IO object [link to pull request]
- This is a serious problem that require reformat MDC1 output file to be compatible with new tracker IO object
  - Pending on 2nd update [link to pull request] on tracker IO objects to run the reformat.
  - This fix should avoid future problem of same kind [by "versioning" IO objects]
- For now (next few weeks), we have to rely on archival build to read the truth association in the MDC1 HF production output
  - For example, the ana.242 build on Mar 27 still works
    source /opt/sphenix/core/bin/sphenix_setup.sh -n ana.242

Special topic 1: Beam use proposal - the 2021 version

Beam use proposal 2021 version

- sPHENIX BUP Task Force preparing addendum of the BUP2020 [sPH-TRG-2020-001]
- Deadline for submission is May 30, 2021 for PAC meeting is June 22-23, 2021
- Interim ALD Charge in 2021: sPHENIX BUP for 2023, 2024, 2025 for 20 & 28 cryo-weeks each
- Focus: argue for 28 week run and 20-week runs would be not cost effective
- Looking for TG input!

What 20-week runs would imply to the run plan?

Year	Species	$\sqrt{s_{NN}}$ [GeV]	Cryo Weeks	Physics Weeks	Rec. Lum. $\lvert z\rvert$ <10 cm	Samp. Lum. $\lvert z\rvert$ <10 cm
2023	Au+Au	200	20	5	1.7 nb^{-1}	2.1 nb^{-1}
2024	$p^{\uparrow}p^{\uparrow}$	200	20	16	0.4 pb^{-1} [5 kHz] 6.2 pb^{-1} [10%-*str*]	62 pb^{-1}
2024	$p^{\uparrow}$+Au	200	–	0	0 0	0
2025	Au+Au	200	20	16.5	10 nb^{-1}	16 nb^{-1}

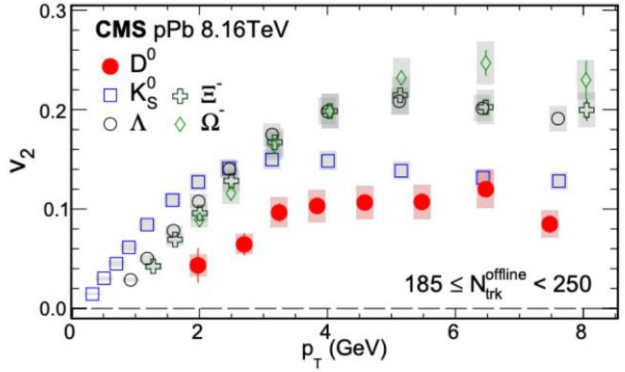
Much shorter physics run in 2023
9 (13) weeks → 5 weeks
Significant increase in commissioning risk and readiness for "golden" pp and AuAu data sets in 2024, 2025

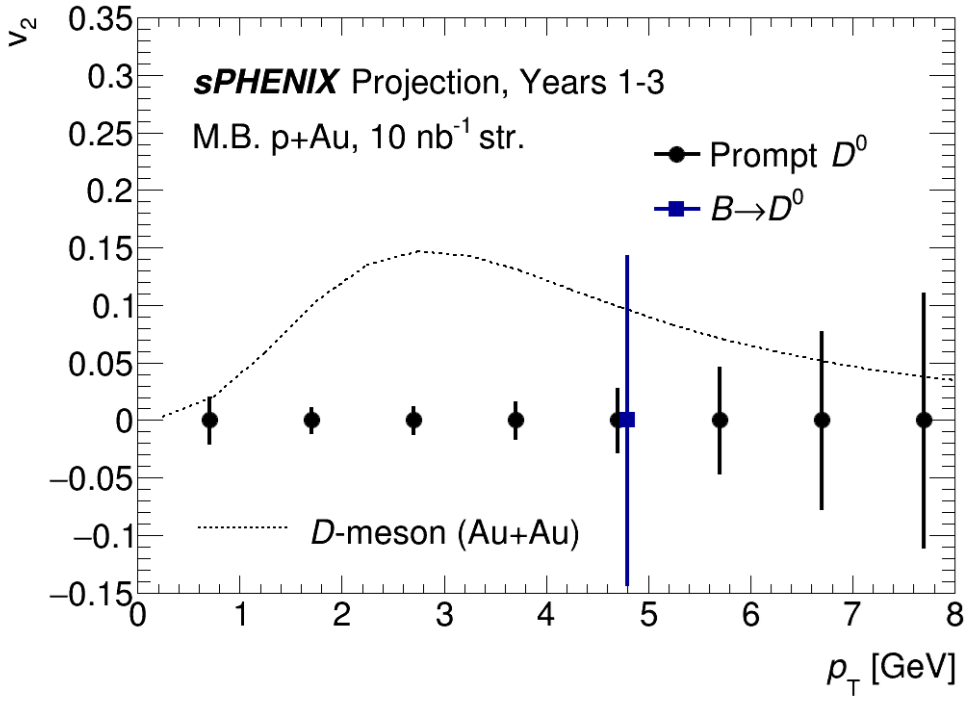
pAu physics completely lost to sPHENIX program

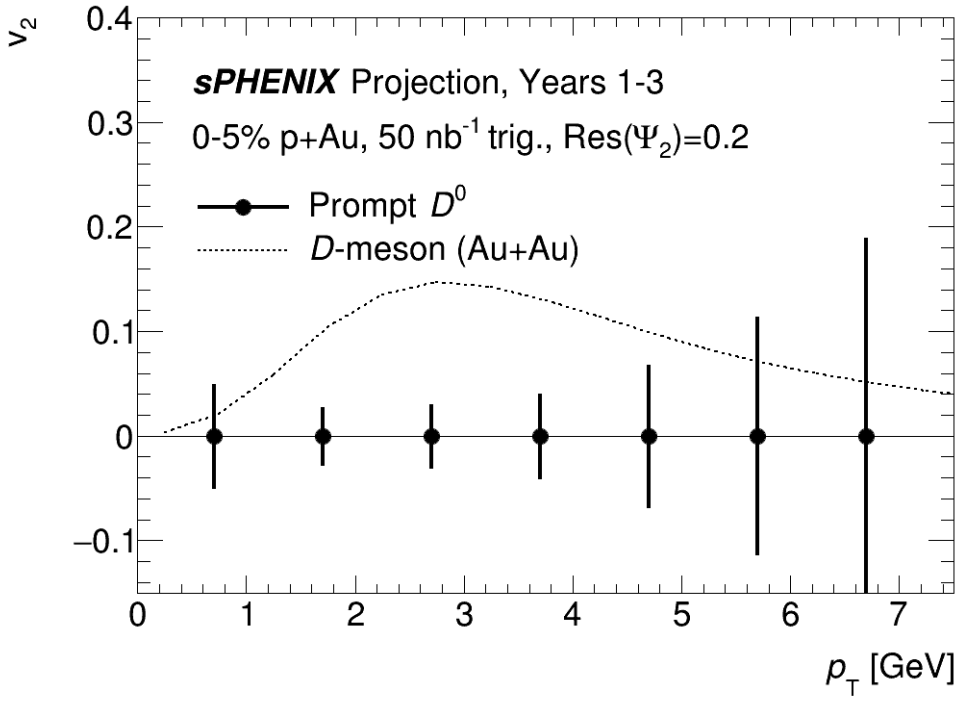
Total 2023-2025 AuAu data set reduced by ~ factor 2 from 28 cryo-week to 20 cryo-week scenarios.

HF consideration 1: loss of pA physics

- If have pA: do we see HF small system flow in central pA?
- Likely good stat. for prompt D. Non-prompt D would be challenging but we could further look at B->HF-e channel
- Projection assumed identical S/B for pA as in AA 60-80% from sPH-HF-2017-002

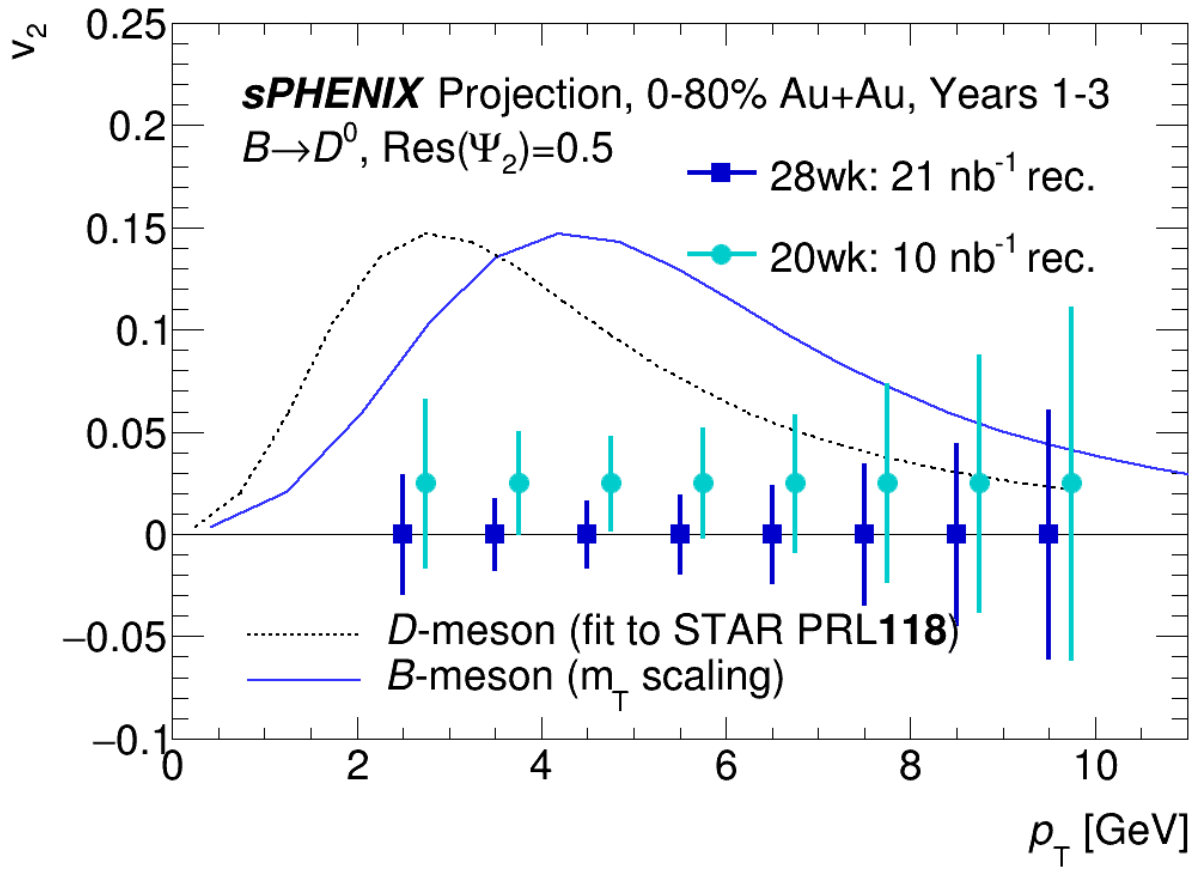






HF consideration 1: AuAu statistics

- If AuAu statistics is halfed due to 20week runs, stat. hungry channel such as B->D v2 would see reduced impact
- Projection based on scaling of statistical significance from [sPH-HF-2017-002, sPH-TRG-2020-001]



Special topic 2: Please participate sPHENIX working group reorganization brainstorming

- Thanks to **Ming Liu** for bringing up this topic to highlight today!

Email from the co-spokespersons:

- As we get closer to the commissioning and data taking period we should continue the evolution of the collaboration structure, e.g., in terms of physics groups, overall physics coordination, physics object reconstruction, etc etc.
- We would like to call a meeting on Fri, May 7, noon-2PM (*) to start this discussion. As many of you have experience both in the sPHENIX TGs and in other experiments, we look forward to suggestions on ideas and best practices sPHENIX should consider for its overall physics enterprise…. In particular, we look for input from the younger members of the collaboration
- Some obvious topics to think about:
  - What is the right number of physics/topical groups (PAGs in CMS jargon)?
  - Which topical groups should be added/subtracted/merged?
  - Should there be "physics object groups" (POGs in CMS jargon) responsible for objects like e.g., jets, e/gamma, tracks, centrality, HF?
  - Do we need a formal mechanism coordinating the physics effort (e.g., CMS "Physics coordination" incl. PAG and POG conveners)? how should that operate?
  - Should there be Physics Co-Coordinators? Number, term, charge?
  - What is the mechanism for forming an author team?
  - ….
- In particular, we look for input from the younger members of the collaboration, but also from collaborators who served in leadership roles in the physics organizations of other RHIC collaborations and the LHC experiments.

Participation of the brain storming

Inputs will be on individual level. Good to see many in HF TG to participate!

Thoughts from Ming,
Thanks for sharing!

sPHENIX HF physics analyses for day-1

Detector commissioning and feedback

- Beam and detector alignment
- Tracking - DCA,
- Good runs for MVTX+INTT+TPC

Physics analyses

- Jet-based at high pT
  - Jet reconstruction
  - HF-tagging in jets
- KFParticle-based at lot pT
  - Exclusive channels
  - D0 etc.
- Other HF tagging, inclusive b-tagging channels
  - Day-1 measurements

Detector and physics object WG:

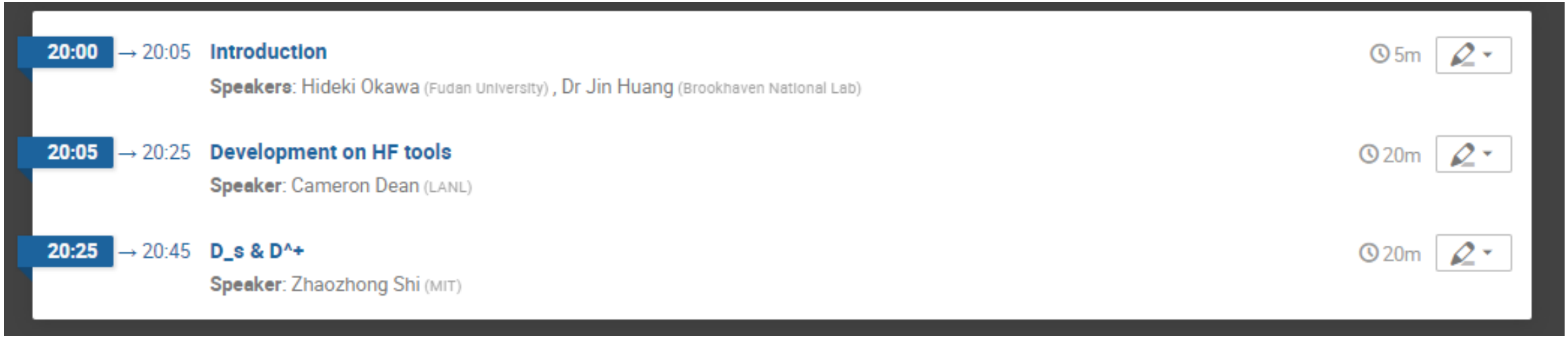
- Understand the detector performance
- Reconstruct physics object, define good runs for physics objects
  Jets, DCA-single travel, Upsilon etc

Analysis WG:

- Apply physics objects in the analysis
- Physic simulations, sensitivity study

- Clearly, a lot of overlaps btw two groups;
- Equal opportunity for conference talks: physics and technical presentations

Today's agenda:

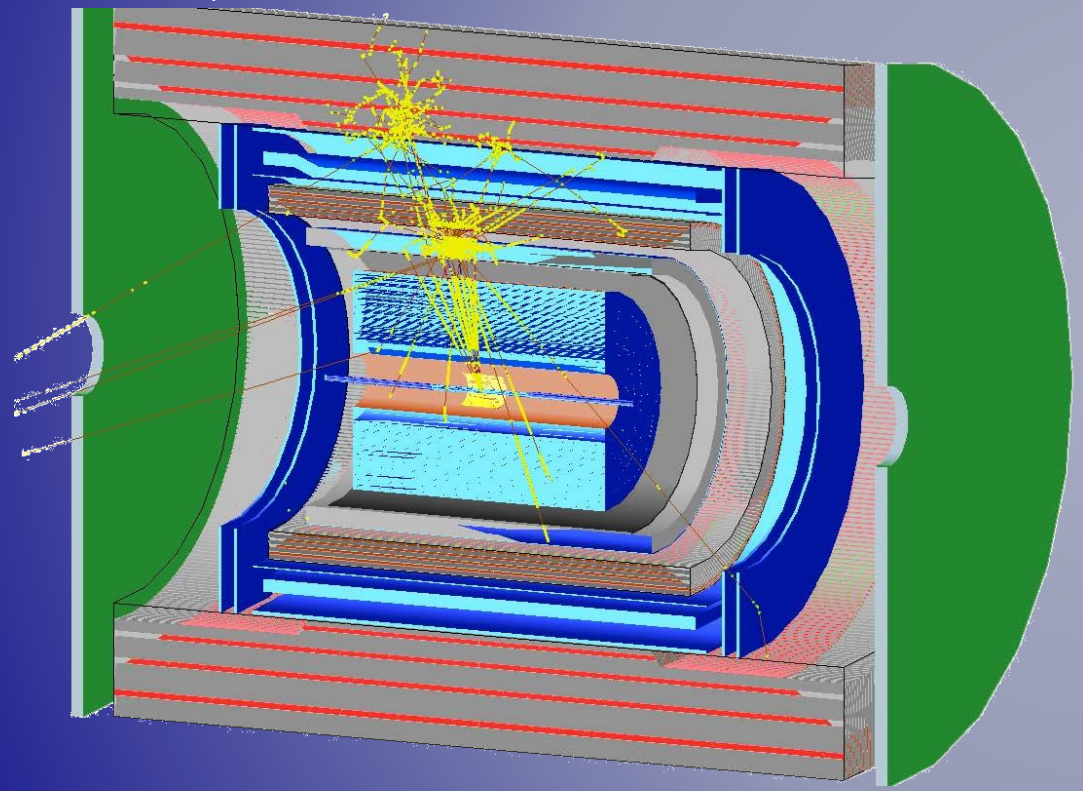


20:00 → 20:05 **Introduction** 5m
Speakers: Hideki Okawa (Fudan University) , Dr Jin Huang (Brookhaven National Lab)

20:05 → 20:25 **Development on HF tools** 20m
Speaker: Cameron Dean (LANL)

20:25 → 20:45 **D_s & D^+** 20m
Speaker: Zhaozhong Shi (MIT)

b-jet, E_T~30GeV



Extra information

Continue HF simulation sample with MDC1 setup

- Taking advantage of MDC1 setup, continue producing high priority sample for HF TG
  - Pending the tracking IO object fix as in the last slide
- MB p+p background sample (thanks to suggestions from last TG meeting)
  - Consider reweighted x-section with q^hat or q^hat binning to help building stat. into high pT/inv mass bins
  - Start with 50M events (should be fraction time used in MDC1)
- Pythia jet samples for pp will be produced this year.
  - Inclusive : 10M
  - c jets : 1M
  - b jets : 1M