

# *RHICf-II meeting*

March 25 (Fri), 2022

# *STAR Spin/Cold-QCD PWG*

- 2022.1.26
- ZDC performance issue
  - 9 o'clock blue-beam Snake failure
  - Luminosity measurement
  - Local polarimeter performance
- Peoplepower issue
  - BNL peoplepower necessary for installation and safety
  - Collaborators in the US
    - Stony Brook Univ: Abhay Deshpande, Joanna Kiryluk
    - Kansas Univ: Michael Murray
    - ORNL: Constantin Loizides
  - Other new collaborators
    - Sejong Univ: Yongsun Kim
- Other issues
  - Available space
  - $\Lambda \rightarrow n + 2\gamma$  background simulation

# *Constantin's suggestions*

- CAD study
  - How to fit two modules
  - Crude implementation, feasibility
- Ukraine situation
  - Second set of pixel layers by next year?
  - One pixel layer each module?
- List of needed tasks and materials
  - More RU necessary for more pixel layers
  - Or, simulation with one pixel layer
- Mechanical engineering with 7mm W
  - Mechanical support

# *List of Materials/Supplies*

- RHICf-II second module as a copy of the SPS test beam prototype
  - Built in 2022-2023, to be installed in 2023-2024
- Pad sensor
  - p-type sensor to be produced in 2022
- HGCR0C
  - v2 or v3? Availability?
- Interface board & aggregator board
- Pixel sensor and readout
  - EPICAL?
- Trigger system
- ALICE standalone DAQ
  - RU/CRU availability?
- Remote-controlled manipulator
- Cables

# *List of tasks*

- Readout procedure of Pad and Pixel sensors
- Support structure and manipulator design
- CAD figure (crude implementation)
- Simulation tasks
  - ZDC + W simulation for luminosity measurement and polarimetry performance with shifted threshold energy of ZDC
  - $\Lambda \rightarrow n + 2\gamma$  background simulation for reconstruction and resolution
  - Detector configuration and trigger scheme
- Blue beam snake failure
  - 2022 data analysis

Collision system & Polarization	Science goals & objects	Measurement time, luminosity or number of events	Trigger rate / DAQ requirement
p+p Radial polarization	High- $p_T$ $\pi^0$ , $K^0_S$ , $\Lambda$ SSA	$1 \text{ pb}^{-1}$ , a few hours with 200 Hz rare trigger	200 Hz rare trigger for high- $p_T$ $\pi^0$ , $K^0_S$ , $\Lambda$ with no-prescale & high efficiency
p+p Vertical polarization	$K^0_S$ , $\Lambda$ Spectrum	$10^8$ events, about a week with 200 Hz shower trigger (with prescale)	200 Hz shower trigger (with prescale)
p+A Radial polarization	High- $p_T$ $\pi^0$ SSA nuclear dependence	Similar to p+p Radial polarization	200 Hz rare trigger for high- $p_T$ $\pi^0$ with no-prescale
p+A Vertical polarization	Photon, $\pi^0$ , neutron, $K^0_S$ , $\Lambda$ Spectrum	$10^8$ events, about a week with 200 Hz shower trigger (with prescale)	200 Hz shower trigger (with prescale)

# *ZDC performance issue*

- Luminosity measurement
  - No effect found in 2017 Vernier scan data
  - Calibration by Vernier scans if necessary
- Polarization measurement
  - Especially, problematic blue-beam snake failure requires a stable measurement
  - How stable we can monitor & evaluate polarization of the blue beam?
    - with shifted threshold energy of ZDC by our detector
  - We'll consider to study it with existing data in 2022
  - We'll plan to test with additional material in front of the ZDC
    - Simulation study, too

# *DAQ requirement*

- STAR data recording with 200 Hz RHICf trigger
  - 10% TPC data recording if possible
  - Remaining 90% without TPC but all other STAR data recording
- Standalone RHICf-II DAQ with independent data stream
  - Event correspondence between STAR DAQ & RHICf-II DAQ with event number sharing
  - Established in 2017 run

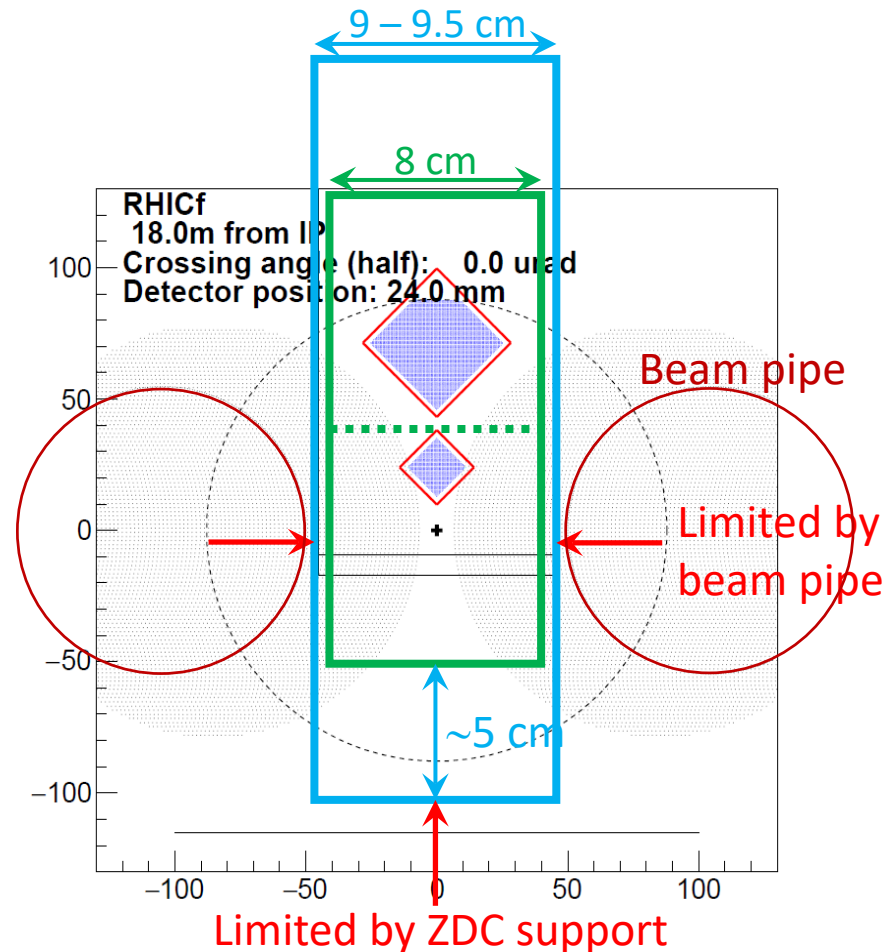


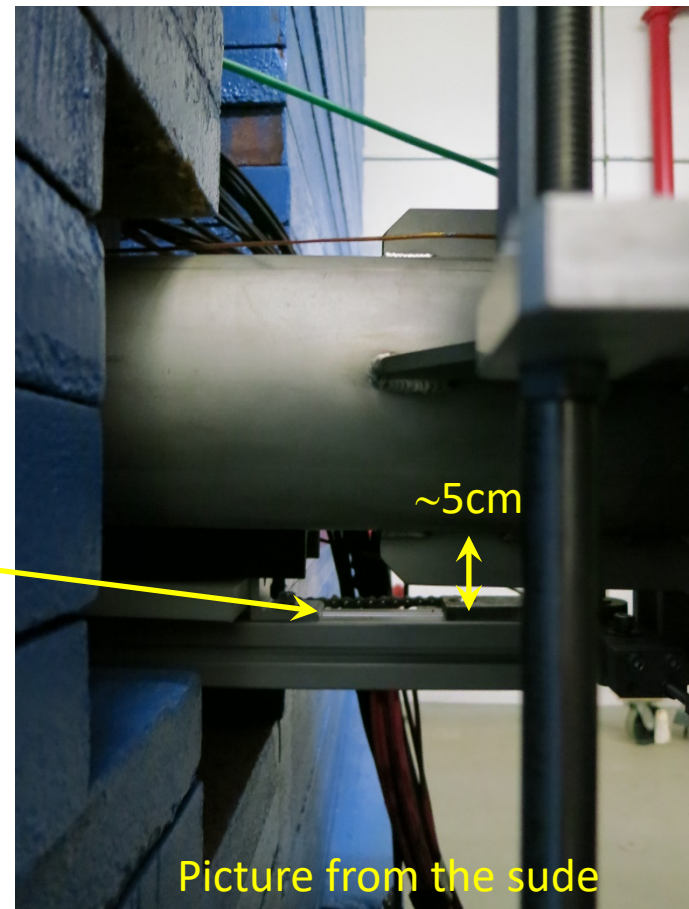
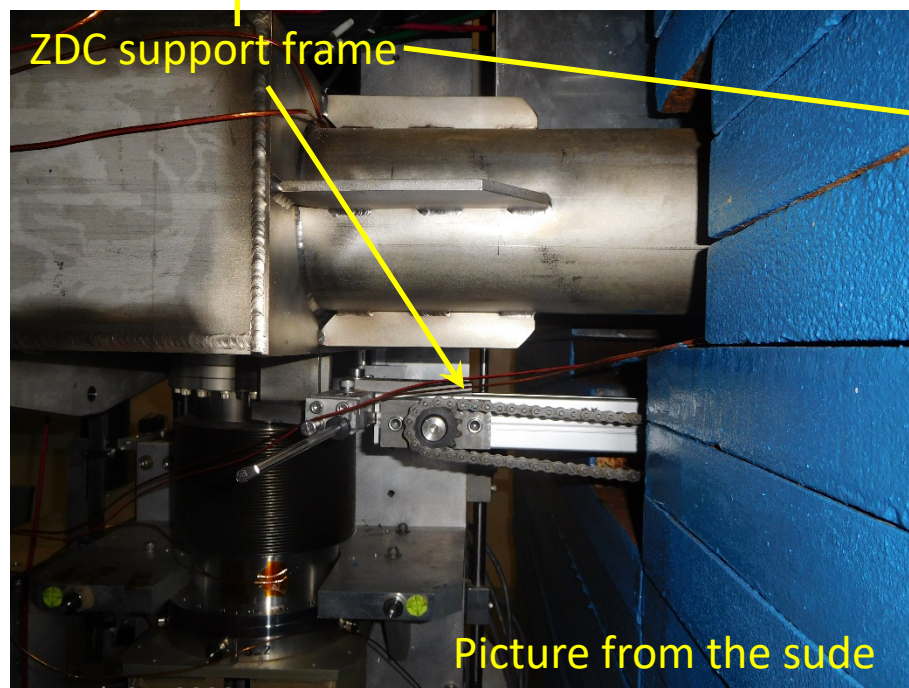
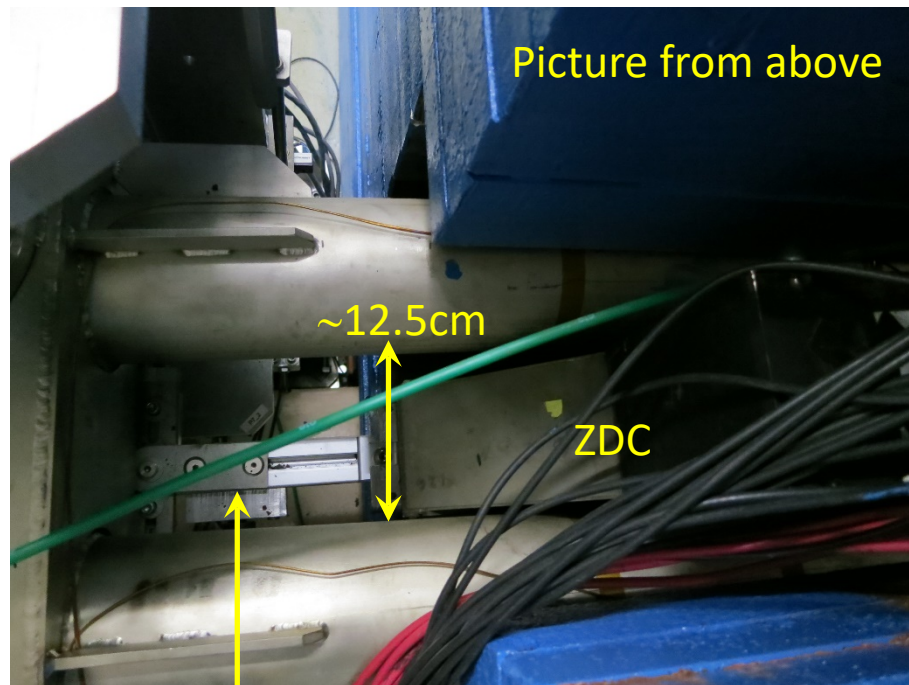
# *Peoplepower issue*

- BNL's peoplepower necessary for installation and safety
  - How can we support it?
- Hardware design and fabrication provided by RHICf-II
  - Remote manipulator in front of the ZDC
- Participation in the STAR shift

# Available space in front of ZDC

- There is a ZDC support frame under the detector.
- Due to its limitations, there is only about 5cm of space.
- The spacing between the beam pipes is about 9-9.5cm.





# *Other issues*

- 9 o'clock blue-beam snake failure
- No Roman pot in 2024 at STAR
- Timeline for the RHICf-II calorimeter construction
  - ALICE-FoCal-E prototype beam test at CERN-SPS in 2022 (September?)
    - Under construction including DAQ
  - ALICE-FoCal-E prototype will be used as the first module of the RHICf-II calorimeter and commissioned at RHIC in 2023
  - The second module will be constructed in 2022-2023
- Background simulation of  $\Lambda \rightarrow n + 2\gamma$  decay will be performed soon
  - Reconstruction
  - Resolution

*Backup Slides*

# *Materials/Supplies* リスト

- SPS test beamのプロトタイプのコピーとして2代目を製作するか？
- Padセンサー
  - p型？
- HGCROC
  - v2 or v3？
- Interface board
- Aggregator board
- Pixel検出器と読み出し
  - EPICAL利用の可能性？
- トリガー系
- ALICE standalone DAQ
  - RU/CRU
- マニピュレータ
- ケーブル

# 作業リスト

- PadとPixelの読み出し方法
- 検出器デザイン、CADの絵
- ZDCへの影響、シミュレーション
  - Shifted threshold energy of ZDC
- Blue beam snake failure
  - 2022 データ解析
- Lambda background simulation
  - Reconstruction / resolution

