MVTX Update

Ming Liu 10/19/2018 sPHENIX General Meeting

MVTX Plan - WBS 3.2 (renumbered)

- MS Project being updated, now moved into P6
 - Stave and RU production through ALICE, moved out of the scope
 - The rest of tasks, being optimize for cash flow
- Early procurements of staves and readout units (RU) through US-Alice
 - DOE and BNL agree, DOE directly pays UTK/US-ALICE
 - Received signed letter from CERN on the cost of 60 RUs and 84 Stave, ~\$1.36M
 - Paperwork in progress, aim to complete by ~ mid November, 2018
- About \$5M to be added to the sPHENIX Management Portfolio
 - Open MVTX accounts in coming weeks
 - As a separated project from the MIE, for the rest of MVTX tasks
 - Monthly report to sPHENIX and BNL upper management
 - Will NOT be part of CD-2/3 DOE review
 - Update baseline cost and schedule by January 2019

Near Term Schedule Update

- RU production through ALICE: 60 RUs
 - Being started at CERN, first batch of full production ~ Dec., 2018
 - sPHENIX RUs available: ~Summer 2019
 - Acceptance test and QA at UT-Austin: starting ~summer 2019
 - Good opportunity for training and contribution
- Stave production through ALICE: 84 staves (ALICE Gold/Silver QA)
 - sPHENIX sensor production ~Dec. 2018
 - 3 months (wafer production) + 1 month (dicing & testing)
 - Stave assembly starts @CERN, ~ April 2016, will take ~12 months to finish
 - Training & contribution at CERN, Stave test and QA
 - Acceptance test and QA at LBNL, ~Summer 2019
 - Hand-carrying staves to LBNL, ~4 trips, ~20 staves each trip

Updated Schedules and Milestones



Recent Progress Highlgights

- Completed sensor/HIC/stave evaluations at CERN
 - Built and tested two HICs with 40cm and 60cm long power FPC
 - Confirmed sensor performance comparable with the ALICE default configuration
 - Sensors irradiated up to 2.7MRad, no problem (updated 9/18/2018).
 - Confirmed low magnetic field in RU/PU racks, <50Gauss; RU/PU designed for 0.5T
 - Addressed all recommendations on stave/sensor R&D and RU from recent BNL review
- MVTX/INTT mechanical integration
 - Mechanical design being updated and 3-D mockup in progress
 - Inner tracking simulation task force, good progress
 - SamTec cables
 - ALICE confirmed signal performance with 8m long readout cables
 - This eases mechanical integration and layout of the services
- Final documentation to address July MVTX Director's Review recommendations
 - MVTX/INTT mechanical integration, draft available
 - Inner tracking optimization near final, optimal INTT layers, ~next week

https://docs.google.com/document/d/1vsm_G7ZLgqv-kBZqK0jF69T_Nx2Uwk0Zxv86jRVxybw/edit?usp=sharing

Sensor Irradiation Test

Findings

BNL Director's Review: July 19-20, 2018

- Irradiation of the ALPIDE sensors to the required 1 Mrad has not yet been done. Extrapolation of results of irradiations up to 500 krad imply it is likely the sensors will continue to operate satisfactorily at 1 Mrad.
- The mitigation strategy of replacing the inner two layers should the sensors only operate up to 500 krad was presented; it is to replace the inner two layers from the pool of 75% spare staves they intend to purchase.

Recently (in 9/2018) ALICE carried out irradiation test up to 2.7MRad: Sensor can still function well with high efficiency and low noise

Sensor Radiation Hardness – OK at 2.7MRad

- Continuous effort by ALICE (@NPI, Czech)
- BNL review recommendation: test sensor up to 1MRad

https://indico.cern.ch/event/758048/

Irradiated ALPIDE sensor (2700 krad) over a large range of threshold settings

has :

1) good efficiency up to threshold ~190 e (Ithr = 100 DAC units) at Vbb = - 3 V, Vcasn = 90, Vcasn2 = 102

2) fake hit rate remains orders of magnitude smaller than the requirement (<< 10^{-6})

Irradiated chip#41 (2.7Mrad) : efficiency & fake hit rate





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sPHENIX GM - MVTX Update No pixel was masked out for the 2.7Mrad chip.

10/19/18

MVTX Detector Mechanical Structure



MVTX + INTT



INTT/MVTX interference solved!

From Mickey

• Much love to the group: Dan, Walt, Rachid, Mike, Ross, etc.



SamTec Cables Tested and Finalized for ITS: ~8m!

• Two cables per IB stave: 2.65m + 5.30m

L: 5300 mm



HDR-206142 (Type A)

L: 2650 mm

HDR-203194 (**Type B**)



10/19/18

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Staves



Current thoughts on outstanding mechanical issues MVTX & sPHENIX:

From Walt

- MVTX
 - Envelope currently meets BNL/sPHENIX requirements to be compatible with INTT and sPHENIX beam-pipe.
 - Details on conical section for all three layers and outer shell still need to be worked out;
 - Interface with analog cable (Samtec) at patch-panel, pin and spring clip used in ALICE
 - Making all three layer's patch-panels similar for construction/fabrication
 - Verify the interconnection/locking of the shells from layer to layer is consistent with the ALICE concept
 - There is a locking pin in each shell how does this function in the ALICE assembly
 - New analog cable patch-panels have been 3D modeled verification of power cable passing through

Integration issues:

- MVTX and INTT
 - Unsettled design for the INTT depending on simulation discussions and conclusion, hopefully by the end of October, number of layers, length of staves, radial position of layers.
 - MVTX interface with extension tube to bring out services from detector.
 - Mounting MVTX assembly
 - sPHENIX beam-pipe, flange removal, placed further out from IP.

From Mickey

Next Activities



- Next OSI Meeting Friday 10/26
 - Cable Routes
 - Grounding Scheme
 - ICD Finalization?
 - Beampipe?

Proposal: 2-day MVTX-Tracking Workfest, @FSU sPHENIX Collaboration Meeting (12/6-8),

Dates TBD: Tue-Wed (12/4-5) or Sat-Sun(12/8-9) Doodle - https://doodle.com/poll/z73e4y2hpahqf4x3

- Update project cost and schedule
 - Tasks and resources
 - Smoothing funding profile for the cash flow
- Discuss and update each institution's role
 - Task list
 - Resources
 - Manpower and schedule
- Inner tracking task force
- Mechanical system integration
- Latest detector and physics simulations

Joint meetings with HF-Jet, INTT, Tracking and Simulation groups

backup



Actions @CERN Many thanks to CERN colleagues! Many are not shown here!







9 sensors



Flexible Printed Circuit (FPC) for 9 HS Signals, CLK, CTRL

IB-STAVE-SOG3

IB_STAVE_storage_plate

ALICE IB Stave



Flexible power extension PCB - DVDD, AVDD and Bias V.

- Soldered to FPC

- To be modified for sPHENIX

Both RUs and Data Cables are at the DAI. Goal is having 20 RUs before Christmas Break, as well as enough data cables to connect the whole IB (24 assemblies, equal to 40 data cables).

