MVTX Integration Update

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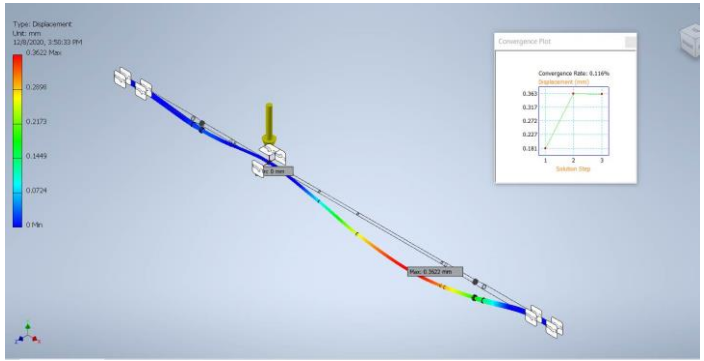
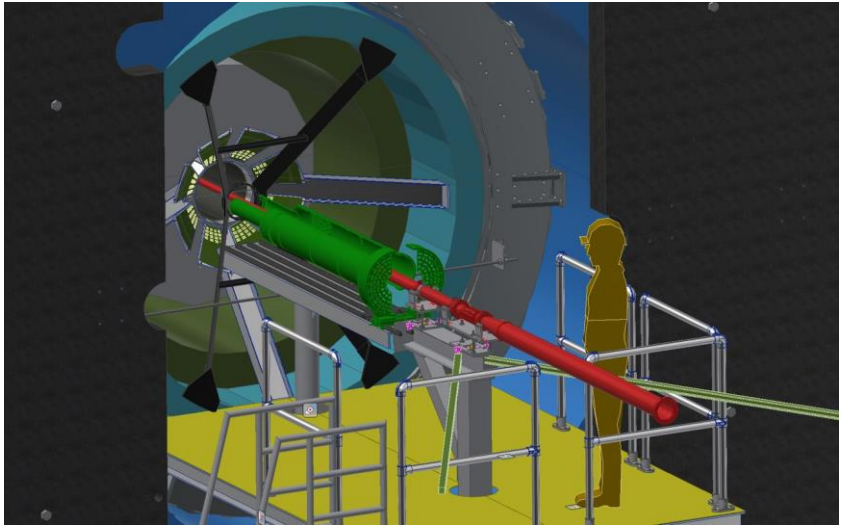
Dec 15th, 2020

BNL





Aspects of MVTX integration in sPHENIX

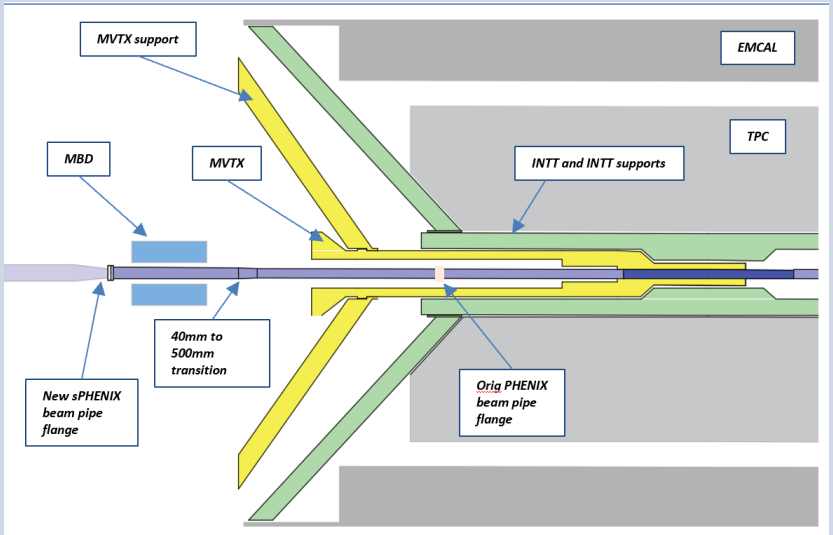
1. **sPHENIX beam pipe engineering**
   A. The original PHENIX beam pipe has been shipped to Materion for the start of the rehabilitation and extension work.
   B. There is an updated beam pipe FEA model for evaluating beam pipe deflection with the latest support design. This work is on going and will be reviewed at a later FDR. The goal is to limit beam pipe deflection to .5 mm at the MVTX-Pipe interface.
   C. Starting analysis and planning for beam pipe high temperature (150 C) bake and protection of surrounding sPHENIX components

2. **sPHENIX core tracking detector installation design**
   A. An advanced almost-final design is in place for the Pipe-INTT-MVTX-MBD installation and support system
   B. Will try to bring to an FDR Winter-Spring 21’

3. **MIT MVTX prototype support**
   A. Ordered linear rails for Bates installation prototype and eventual use on sPHENIX core detector installation table

MVTX sPHENIX Interfaces

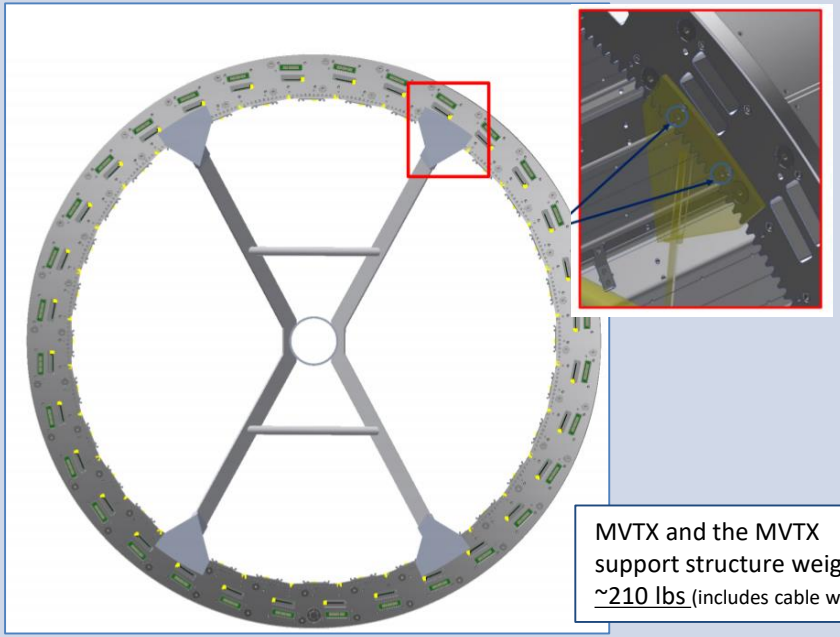
MVTX fit between INTT and Beam Pipe



- *Clearance with INTT: radial 4 mm*
- *Clearance with beam pipe: radial 2 mm*
- *The allocated design space for all components in sPHENIX is tracked in drawing 205-0000-0000 Rev B → all detector systems have conformed to allocated space*

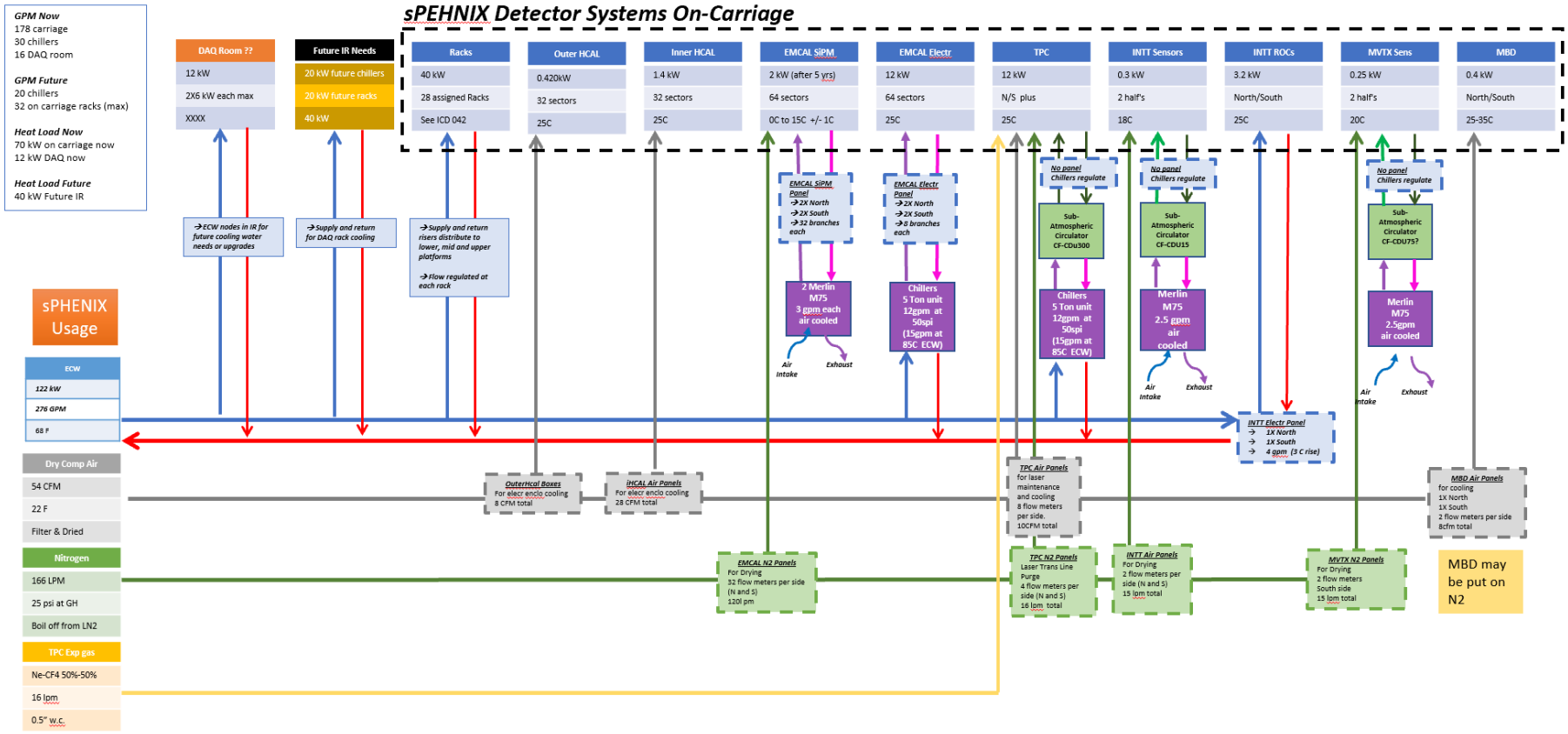
MVTX Support with iHCAL South End Ring

→ ***Set of ½-13 tapped holes for MVTX structure attachment***
→ ***Have worked closely with MVTX team to set hole location***



MVTX and the MVTX support structure weigh ~210 lbs (includes cable weights)

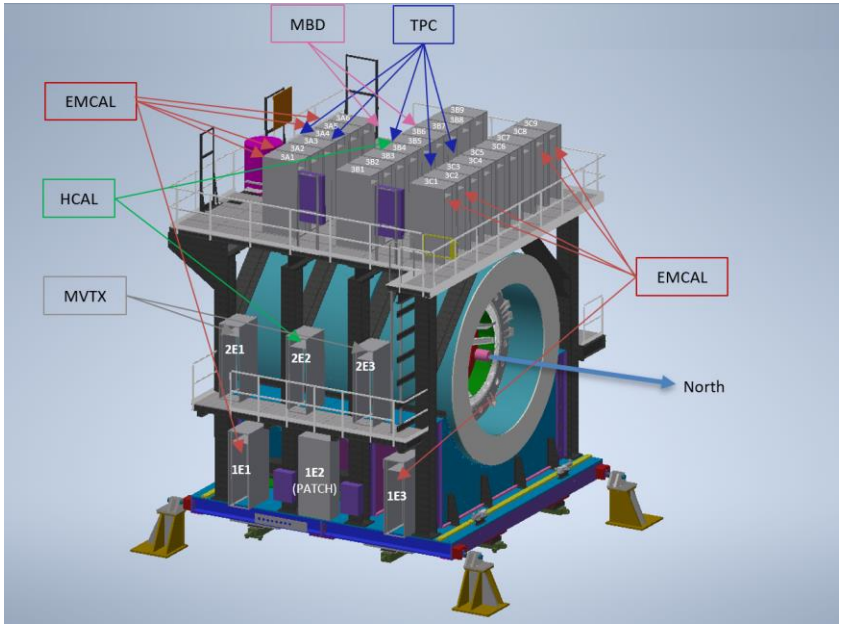
MVTX sPHENIX Gas and Cooling Infrastructure Interfaces

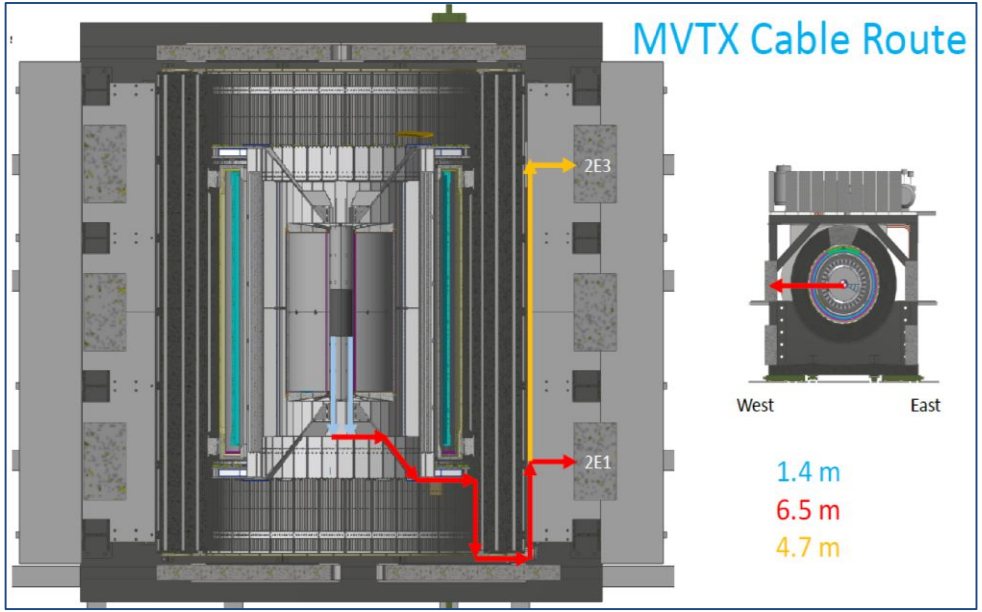


MVTX sPHENIX Electrical and Control Infrastructure Interfaces → ICD-042

- ICD-042 Rev C documents a wide range of interfaces between sPHENIX detectors, on-carriage racks, DAC and other aspects of electrical infrastructure.
- ICD-042 is a living document (currents at Rev C) and there are ongoing discussions between the infrastructure planning team and MVTX. *This does not impact the MVTX items reviewed in this PRR.*

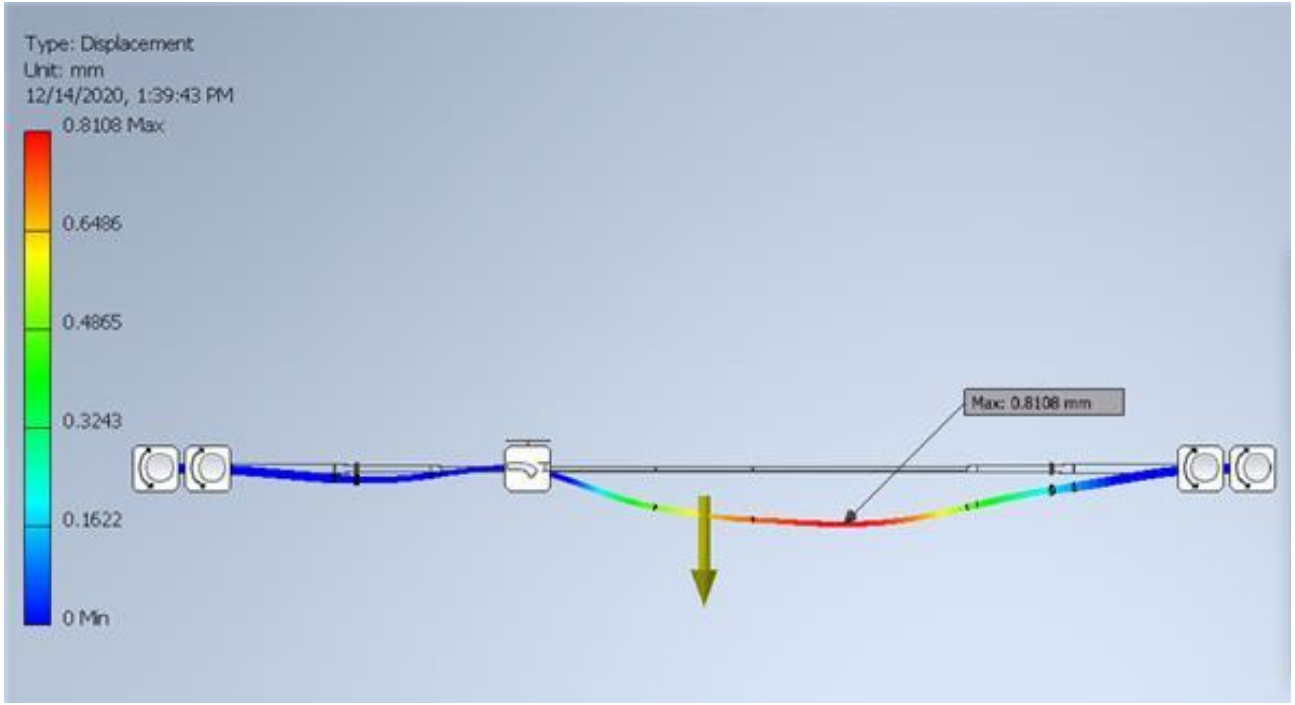
Example of items in ICD-042



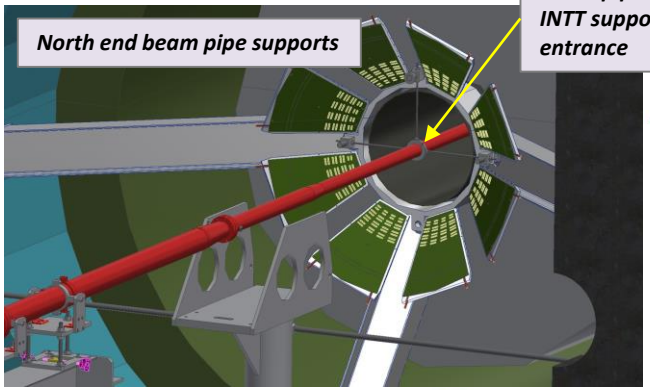


Beam pipe support and deflection analysis –> current status

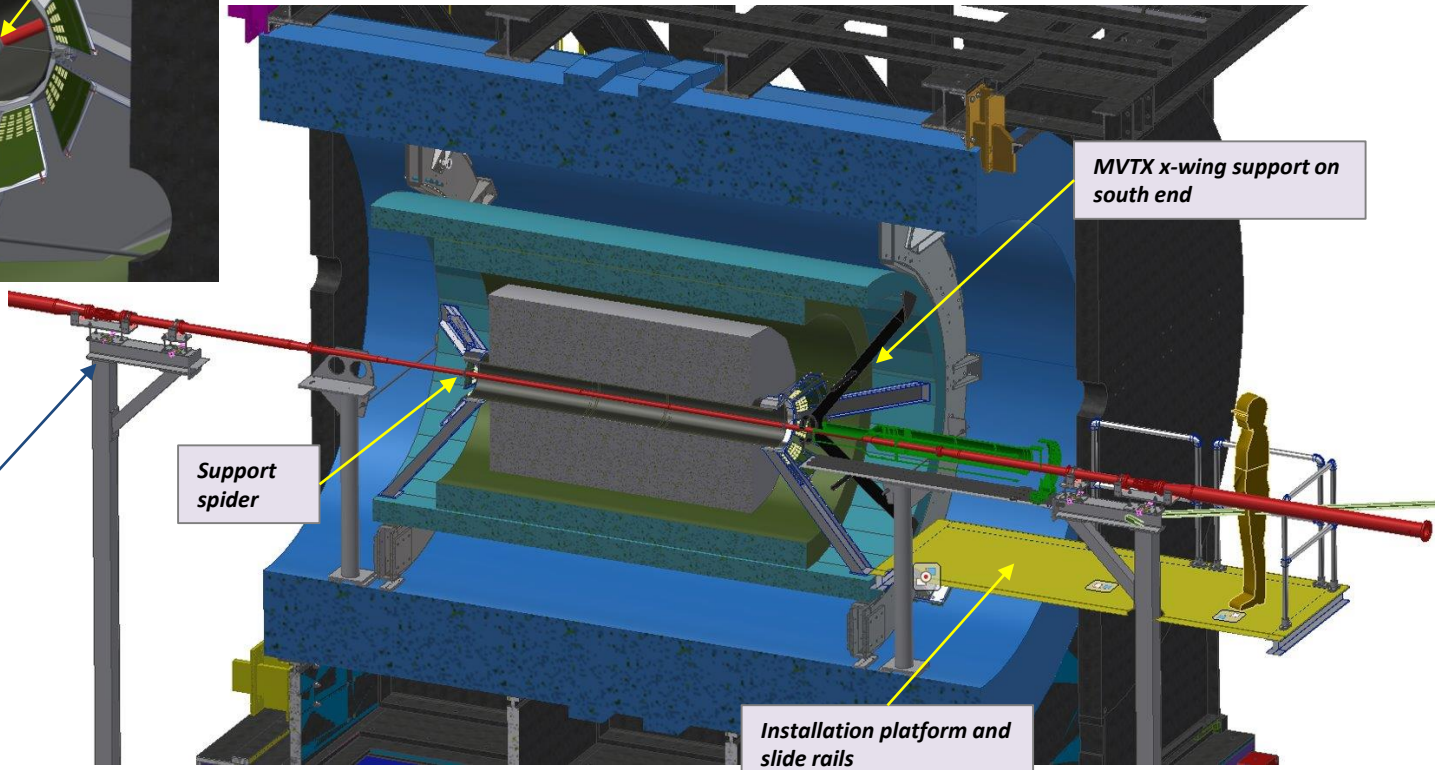
1. Current supports design (see next couple) → pipe sag = ~.81 mm
2. New engineer, Brian Brenton, working with Rich Ruggiero to bring this down to .5 mm or less…with some creative design on the north side
3. Expect to have solution by late January.



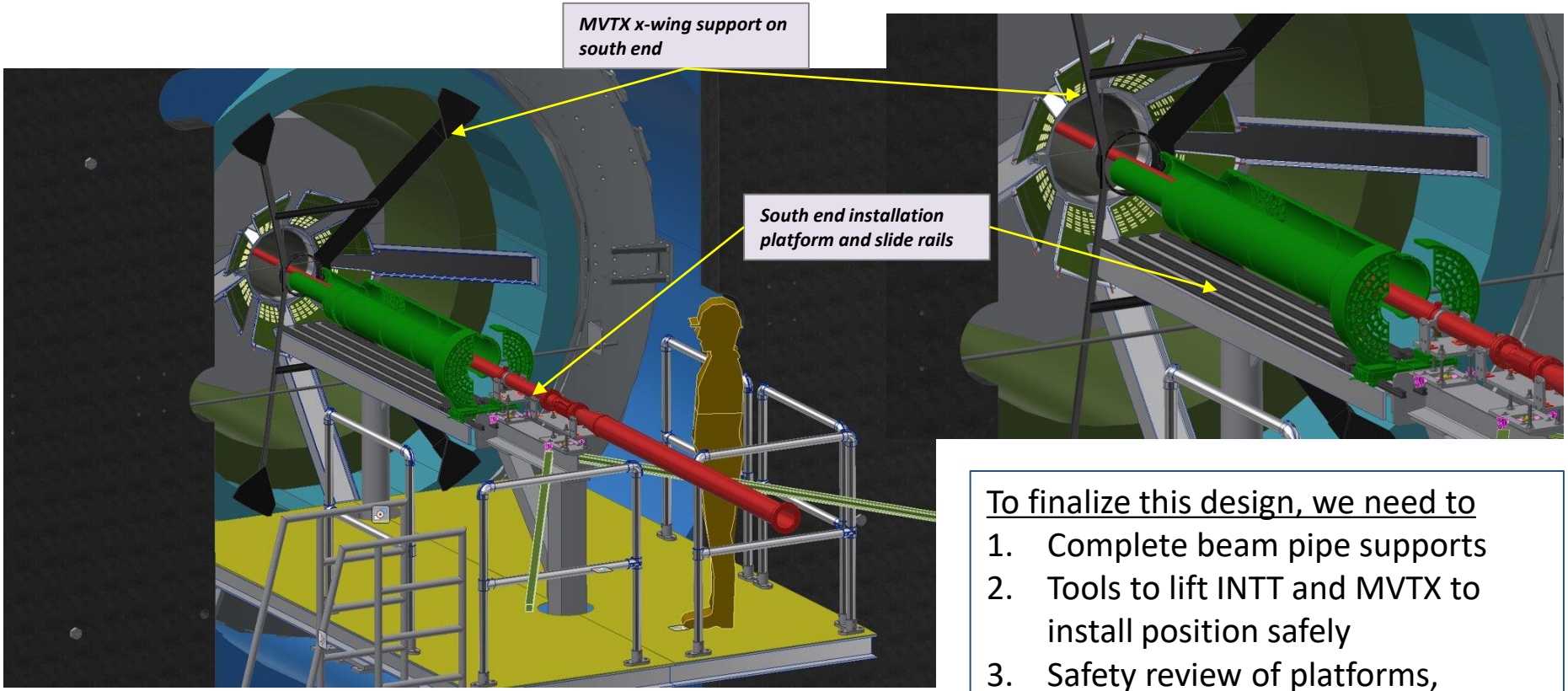
MVTX installation around the beam pipe



Want to keep all permanent beam pipe supports on North side so pipe can be fixed and surveyed before MVTX installation



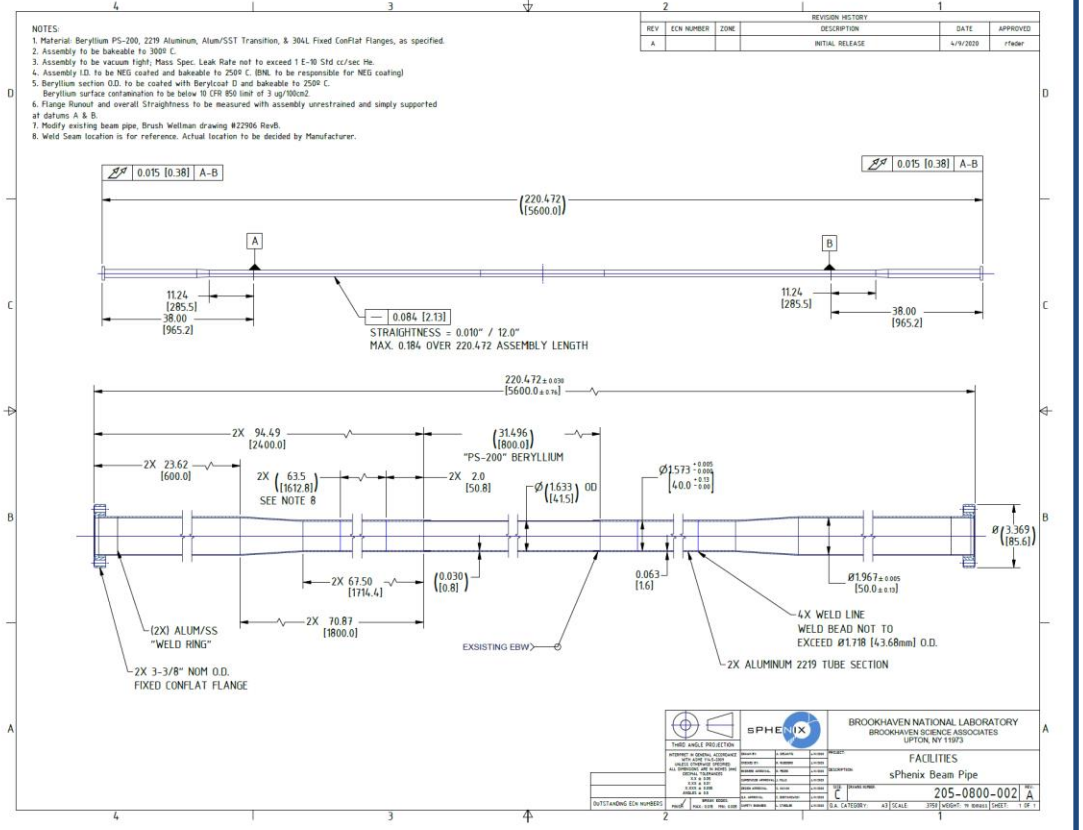
MVTX installation around the beam pipe



To finalize this design, we need to

1. Complete beam pipe supports
2. Tools to lift INTT and MVTX to install position safely
3. Safety review of platforms, ladders and procedures.

sPHENIX beam pipe extension and rehabilitation



205-0800-002_v3 → New sPHENIX Beam Pipe Drawing

sPHENIX Beam Pipe Status

- The beam pipe has arrived at Materion and they are starting the process of salvaging the beryllium section removing the old damaged NEG coating
- Current plan shows new beam pipe arriving at BNL by late August 2021. BNL will then apply a new NEG coating.
- Final BNL review of Materion drawings and weld plans by mid-January.

Conclusion

1. The sPHENIX beam pipe is now with Materion for the start of extension and rehabilitation work. Beam pipe installation, support and bake engineering continue. Design and analysis of a beam pipe support set to keep the sag at .5 mm or less is on going. Expect to have a solution by late January 2021.

2. Interfaces between MVTX, other sPHENIX surrounding detectors, the beam pipe, installation tools and with sPHENIX electrical and control infrastructure are well defined and tracked in ICDs and the sPHENIX Inventor CAD assembly model. Interfaces effecting the production of the MVTX CFC components and X-Wing support structure have been locked in and well understood for some time.

3. There will be a design review in early 2021 for the integrated beam pipe, INTT, MVTX and MBD installation and support structures, tools and planning.