

Performance Study of the Inner Tracker Upgrade Simulation

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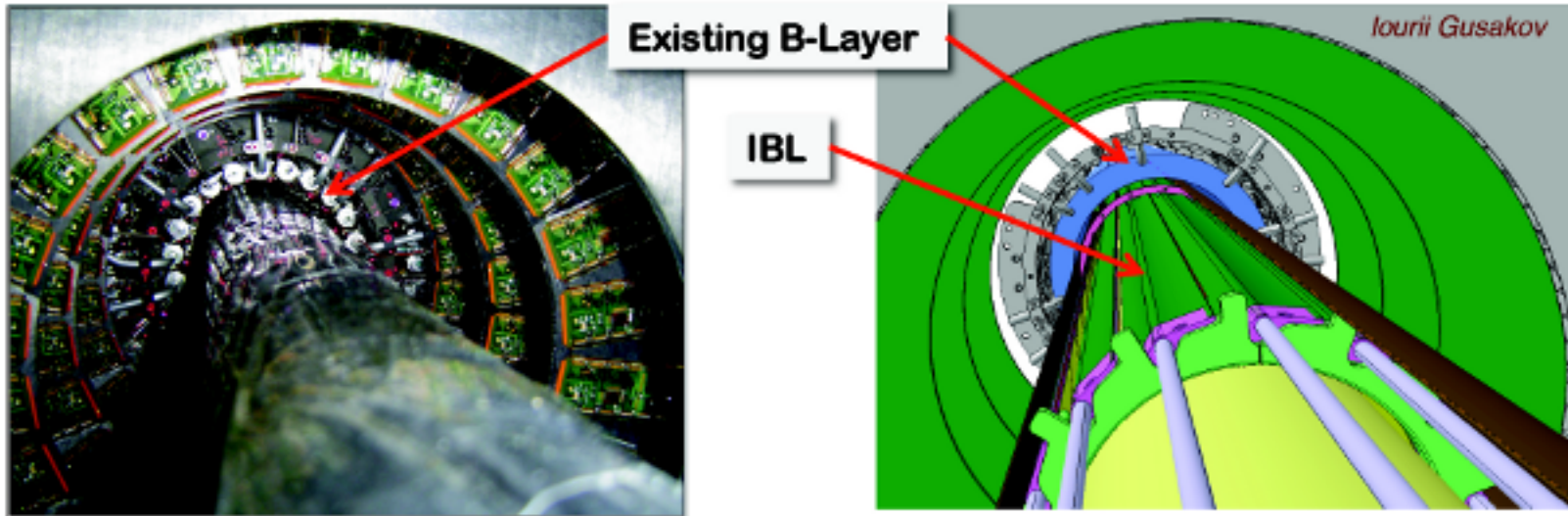
Shih-Chieh Hsu & Lynn Marx

University of Washington

19.07.13

IBL Pixel Detector

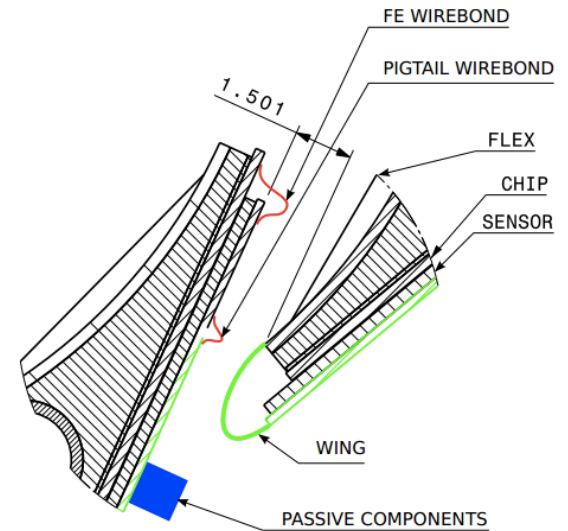
- Provides a very high precision set of measurements as close to the interaction point as possible
- Subject to high levels of radiation damage
- Insertable B-Layer



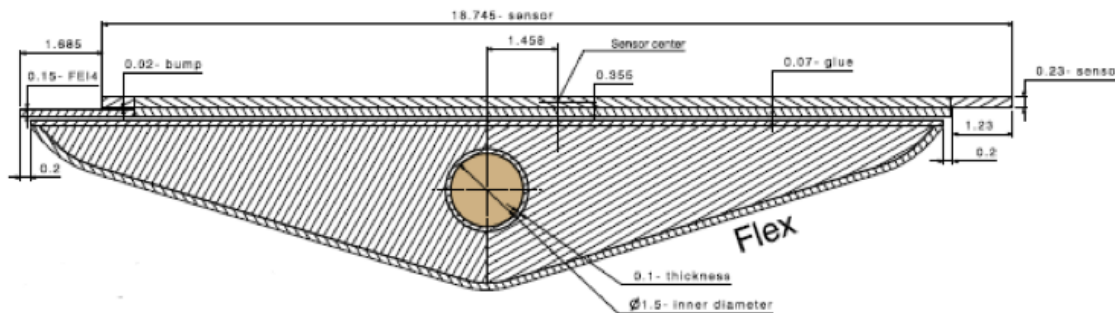
Parts of the IBL

- Flex
 - Flex cable runs along the back side of the stave
- Sensor
 - Sensors are bonded onto the frontend chips
- Chip

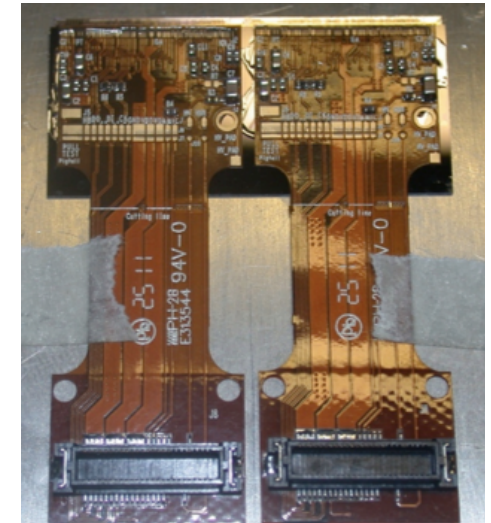
Cross section of half of a stave



Flex



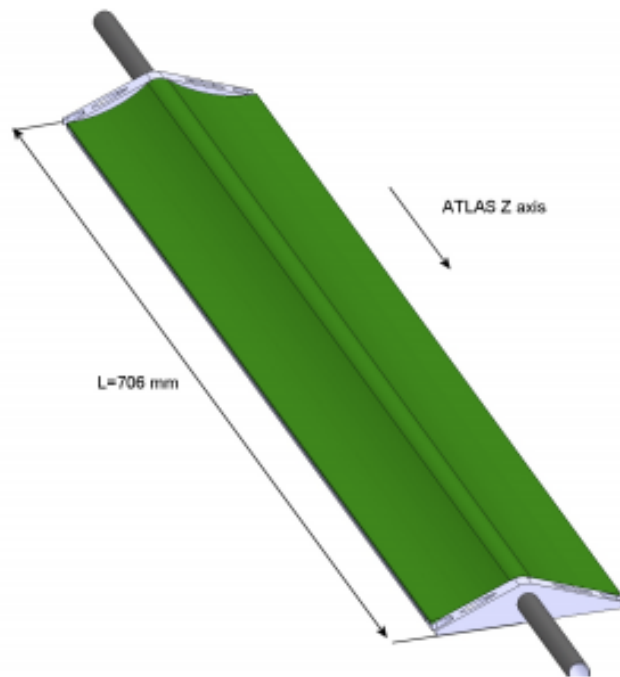
Cross section of an IBL stave



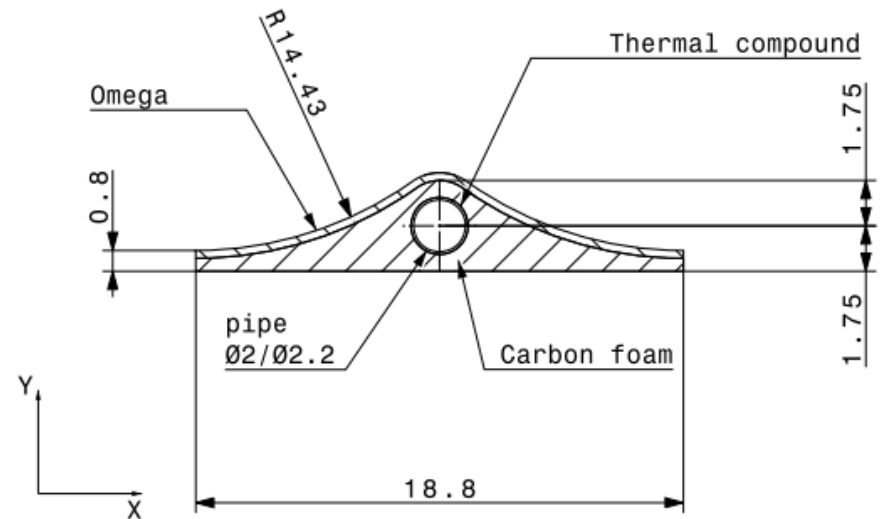
Parts of the IBL - Stave

There are three parts to the stave

- CarbonFoam
- CoolingPipe
- Omega



Stave



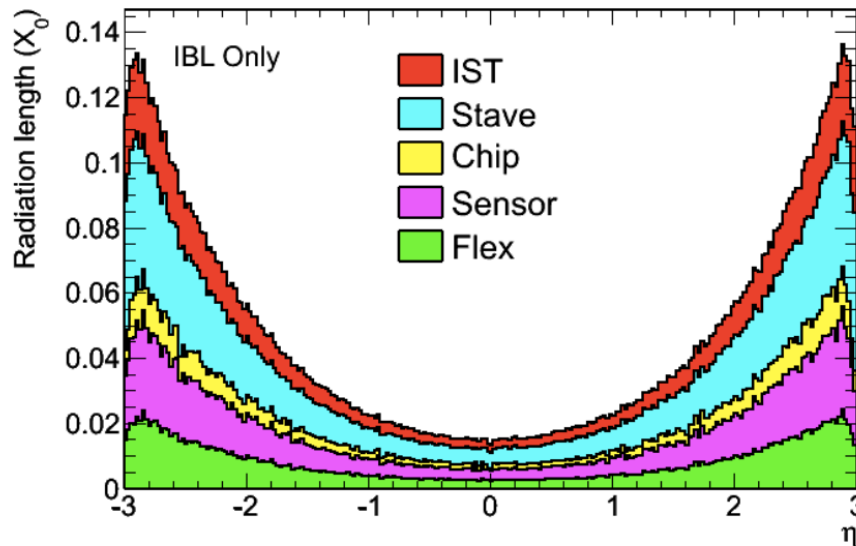
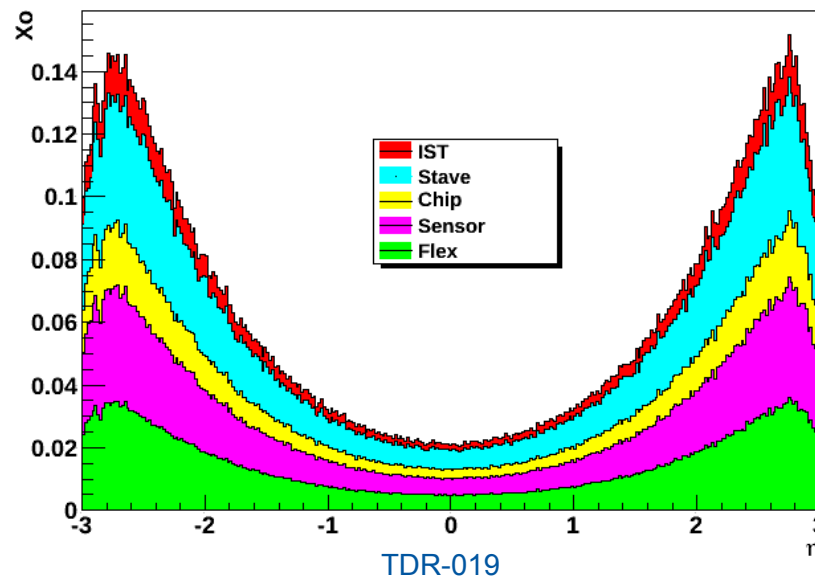
Cross section of a stave

IBL Histogram

- Flex
 - HybridBrl
- Sensor
 - siBLayLog
- Chip
 - ChipBrl
- Stave
 - CarbonFoam
 - CoolingPipe
 - Omega
- IST
 - FacePlate

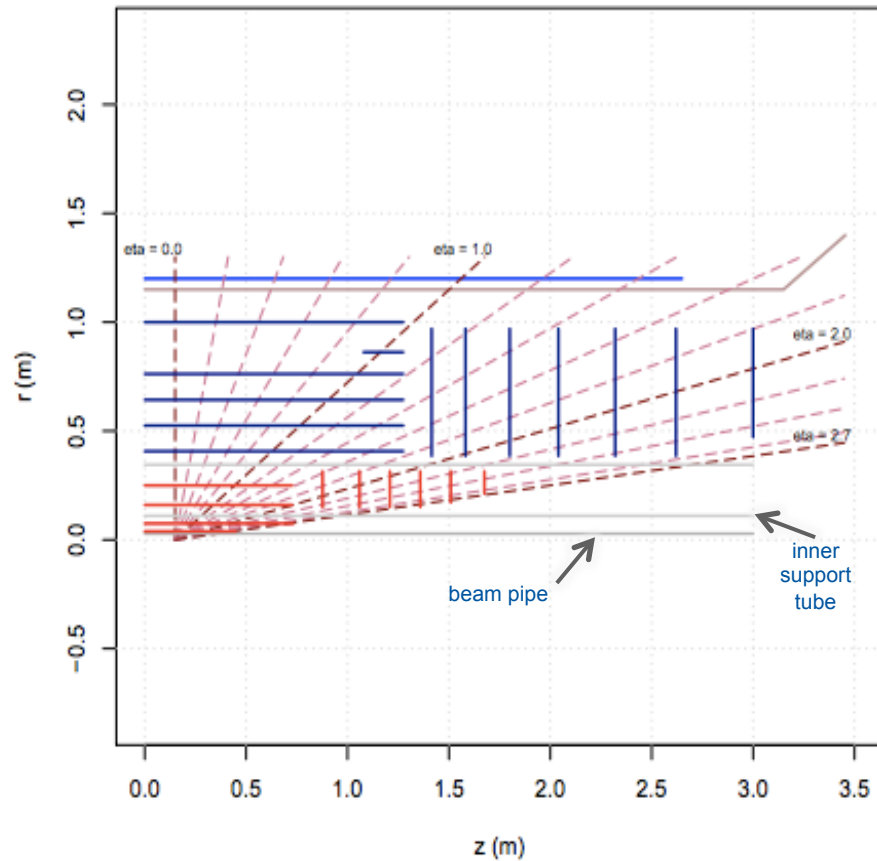
IBL - Layer 0

My Graph

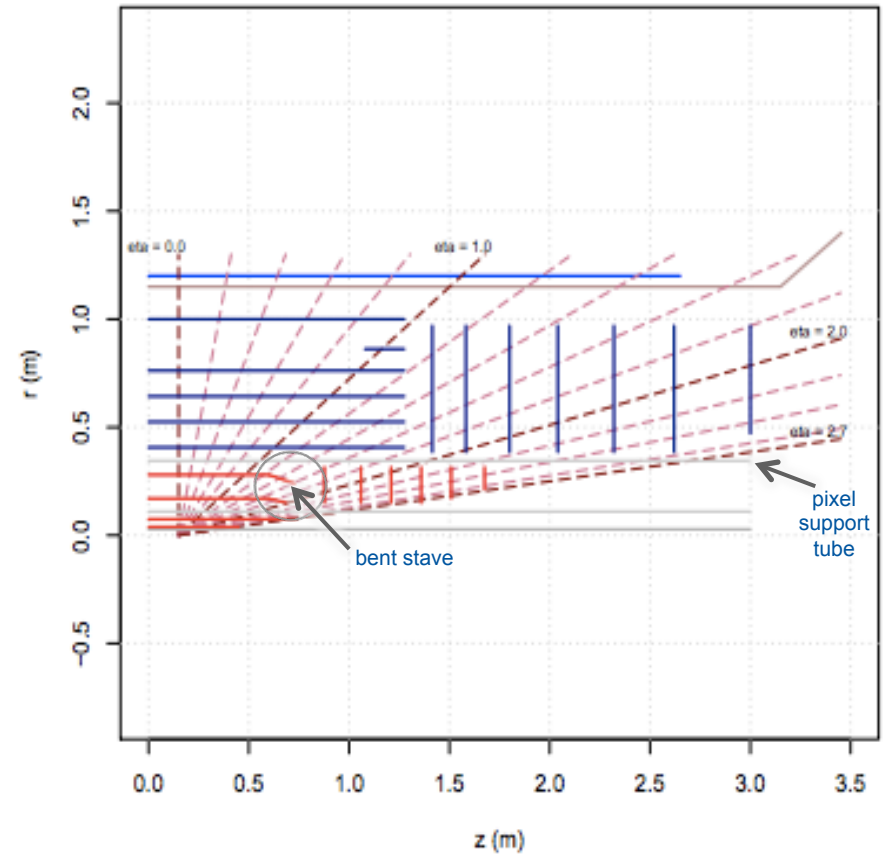


LOI vs Conical

- Red Pixel
- Blue Silicon Micro-Strip
- Horizontal lines – Barrel Layers
- Vertical lines | Endcap disks
- Bottom grey line Beam pipe
- Middle grey line Inner support tube
- Top grey line Pixel support tube



LOI Layout

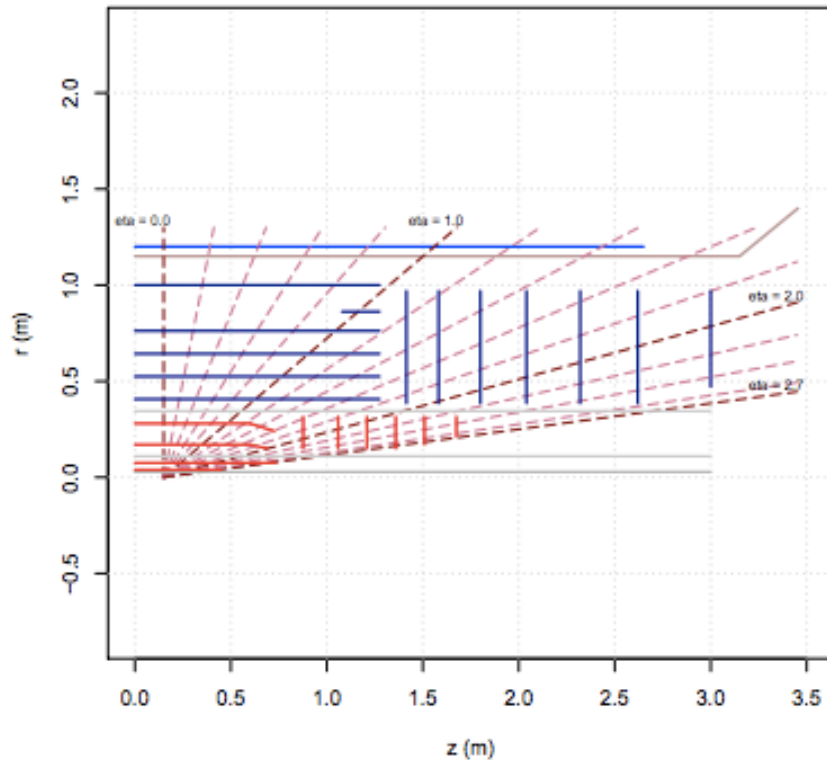


Conical Layout

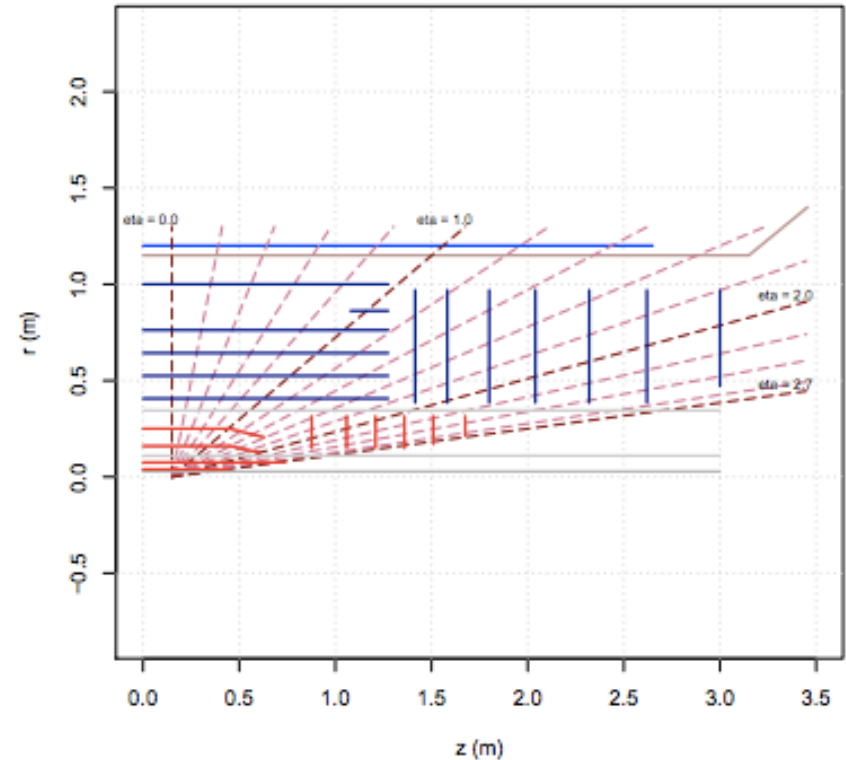
Conical Layout

- Based on integrated staves structures with a flat middle section and bent ends known as bent staves
- Pros
 - Barrel and endcap can have the same radius
 - Integrated staves help to reduce mass & front-load integration effort
 - Integrated stave makes assembly faster by allowing multiple modules to be mounted on it
 - End of Stave (EOS) cards can serve a group of modules with small services as opposed to each module having its own service
- Cons
 - Drawback is that the EOS cards must take up physical space at the end of the stave
 - Bent stave increases the physical distance from the last active pixel on a stave to the first active pixel on the corresponding endcap

Conical A vs Conical C



Conical A - two outer barrel layers placed equidistant between inner pixel and strip layers



Conical C - two outer barrel layers left at the same radii but shortened to reduce the silicon area

Summary

- Completed
 - Familiarity with Linux/C++/ROOT
 - Reproduction of TDR-019 study
 - Radiation length calculation for IBL layout
- In Progress
 - Radiation length calculation for LOI
 - Radiation length calculation for Conical layout
 - Track performance of various ITK layouts*



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