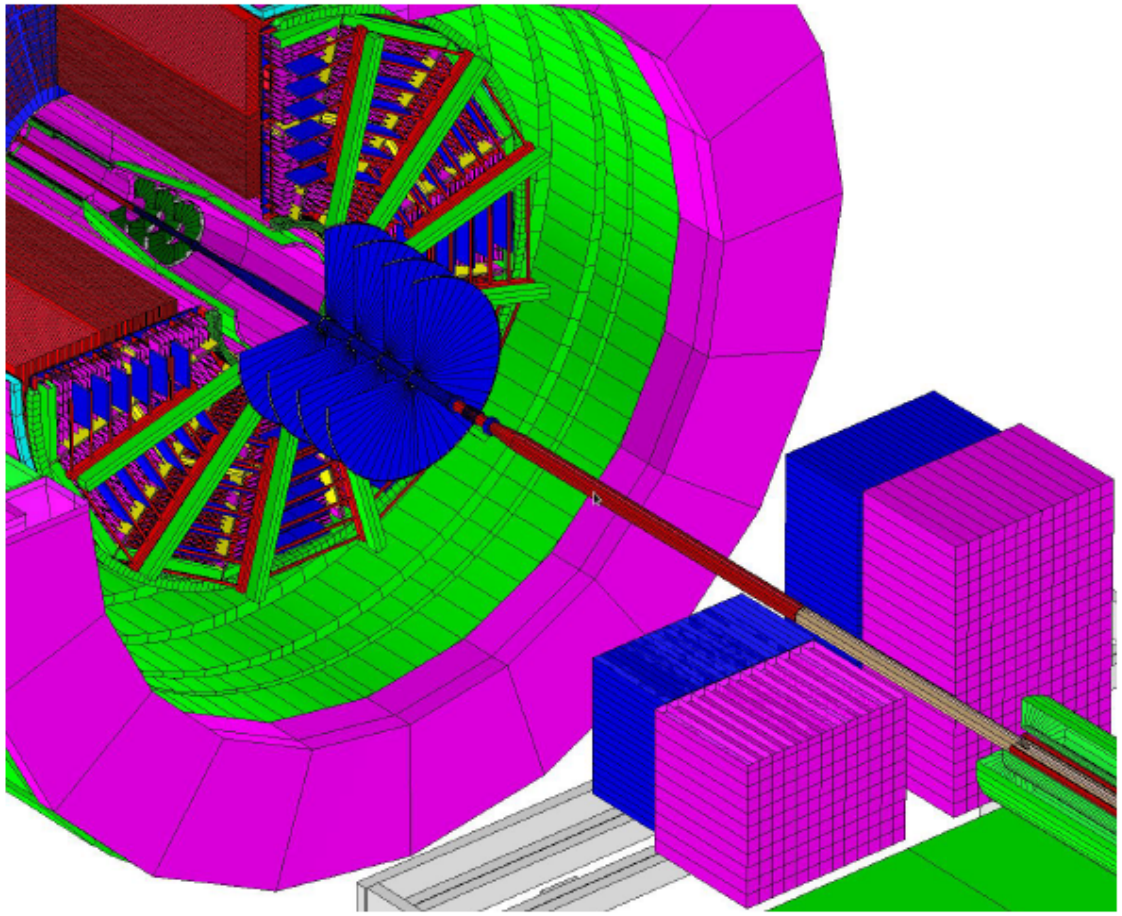
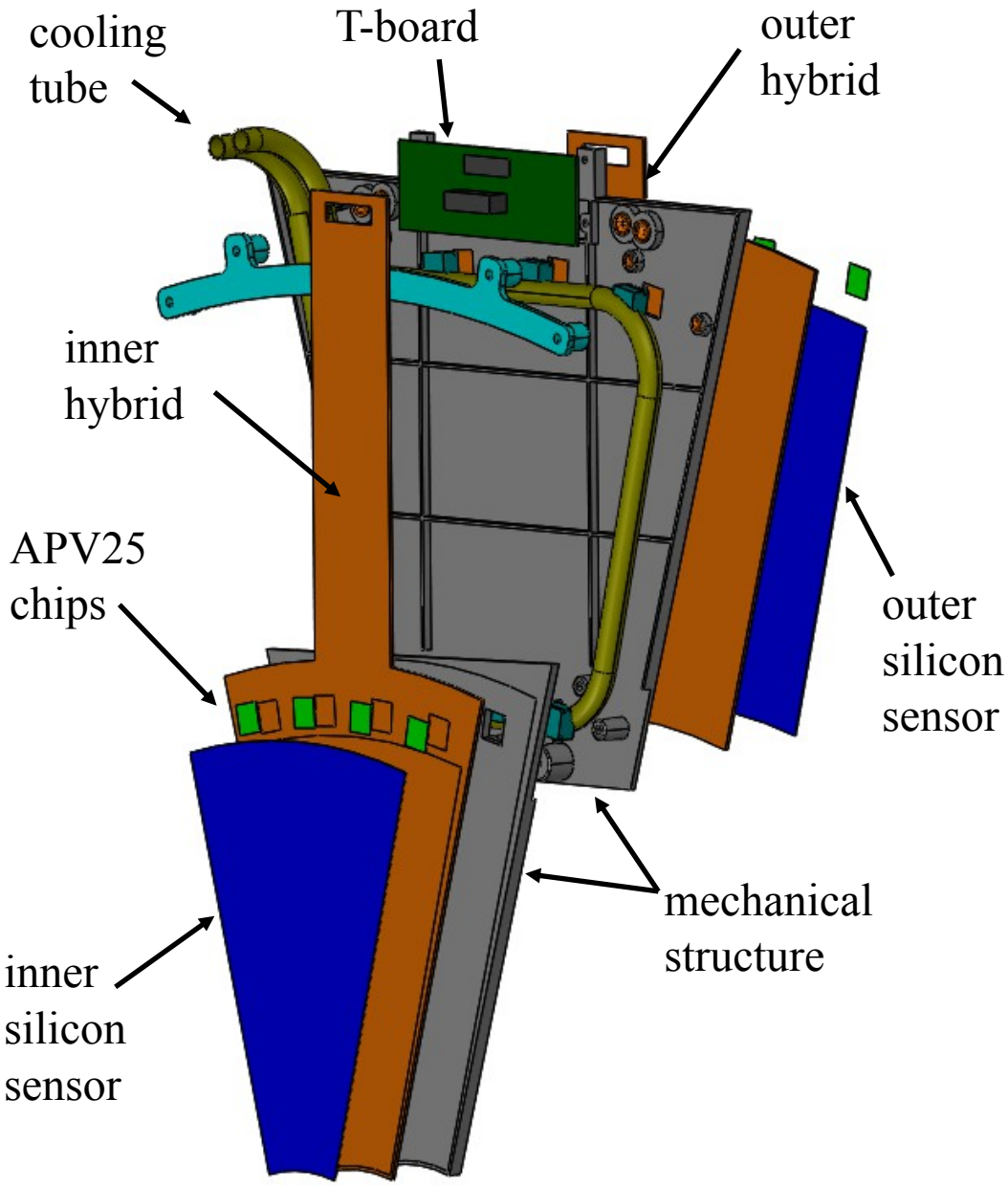


STAR FST Module Assembly

Zhenyu Ye
University of Illinois at Chicago

U.S. DEPARTMENT OF ENERGY | Office of Science

STAR Forward Silicon Tracker – Module Assembly

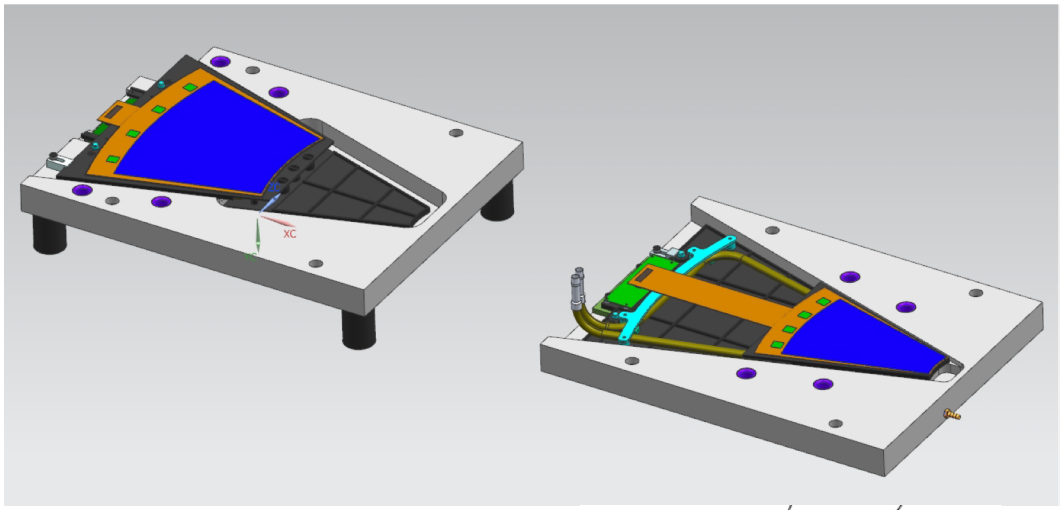


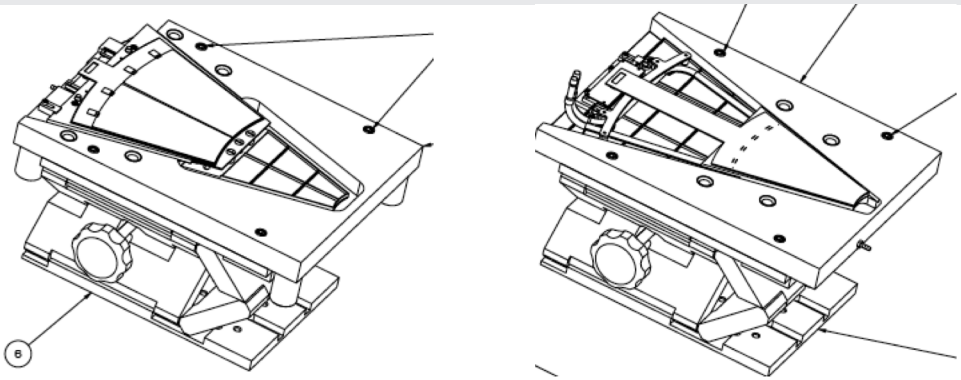
- **APV25: UIC**
  - ordered by UIC in 2015
- **Silicon sensor: UIC/BNL**
  - ordered in 2/2019
  - received 4+6 in 8/2019
- **Hybrid: SDU/IU**
  - design signed off in 11/2019
  - received ~40 in 12/2019
- **Mechanical structure: NCKU**
  - two sent by NCKU on 2/17 and received at UIC on 2/24

- Mount passive components onto hybrids
- Gluing hybrids onto mechanical structures
- **Mount APV and sensors onto hybrids**
- Evaluate prototype module performance
- QA production modules

STAR Forward Silicon Tracker – Module Assembly

https://drupal.star.bnl.gov/STAR/blog/yezhenyu/forward-silicon-tracker-module-assembly





Assembly Fixture/Tooling

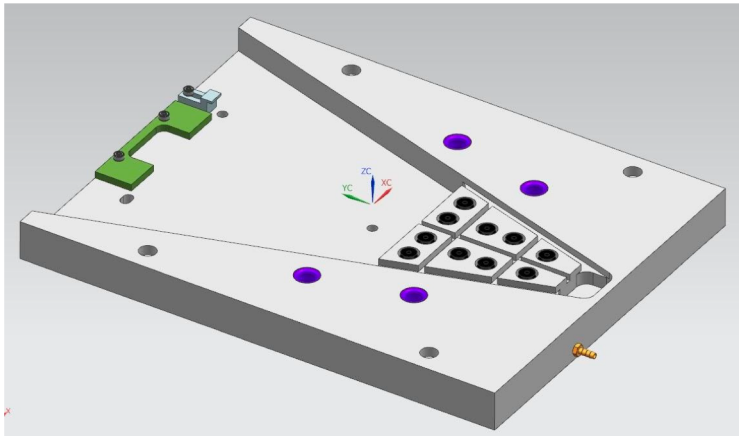
1. Design completed by FNAL around 12/18/2019
2. Parts fabricated at UIC around 1/20/2020

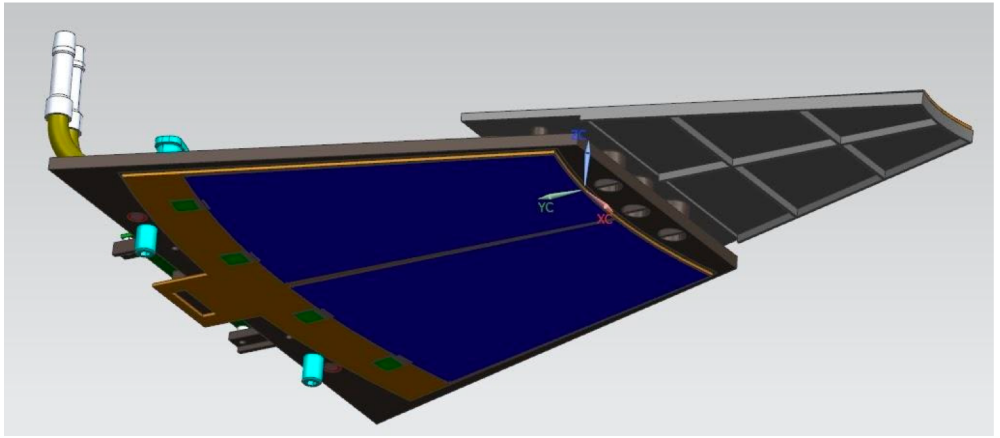
Assembly Procedure

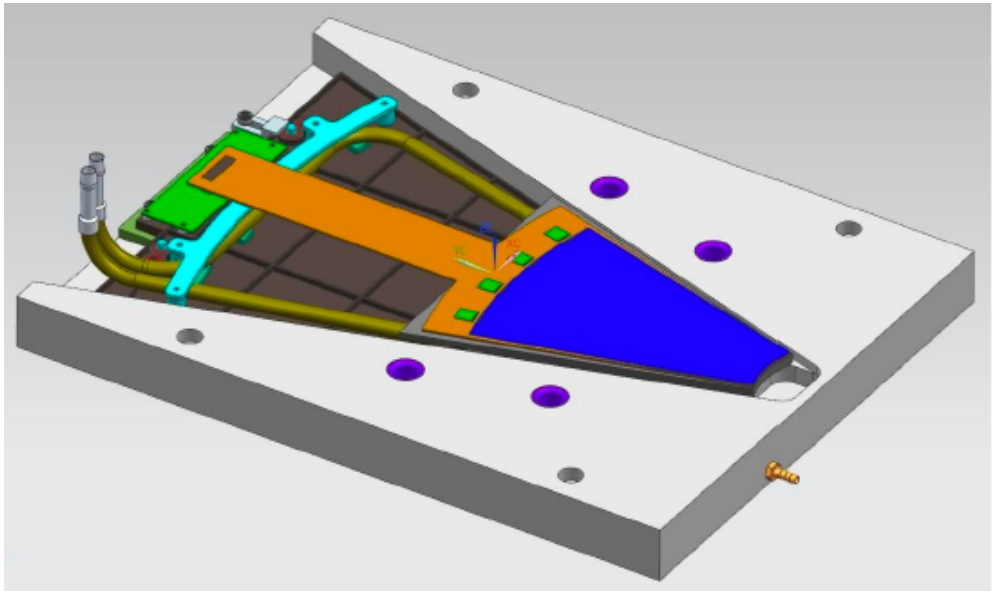
1. APV mounting and wire-bonding
2. Readout test
3. Sensor mounting and wire-bonding
4. Survey
5. Readout test
6. Encapsulation
7. Readout test

- **Prototype module**: 3 modules, each with 3 Silicon sensors and 8 APVs
  Assembly: 2019/9-2020/2; Testing: 2020/3-2020/4
- **Production module**: 48 modules, each with 3 Silicon sensors and 8 APVs
  Assembly: 2021/1-2021/4; Installation and testing on supporting structure: 2021/5-2021/6

STAR FST Module Assembly

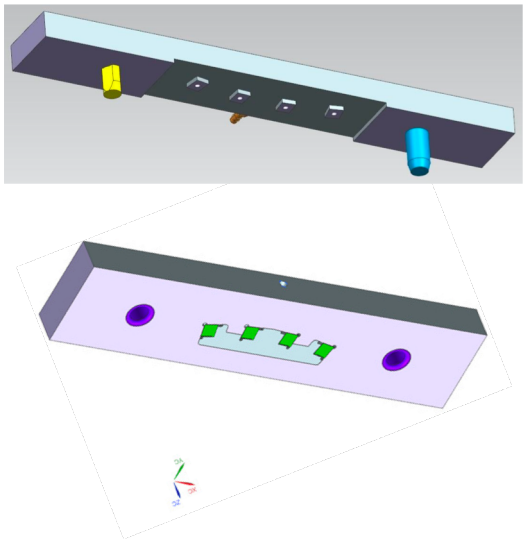


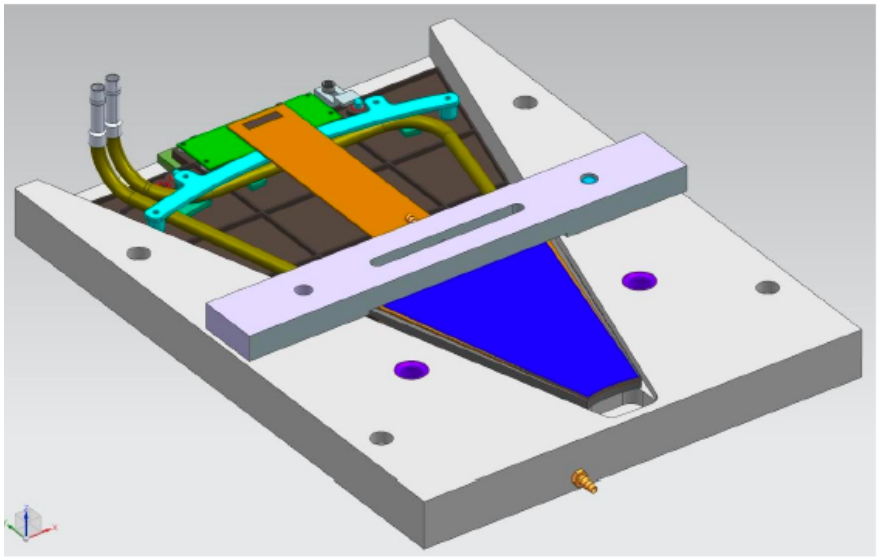


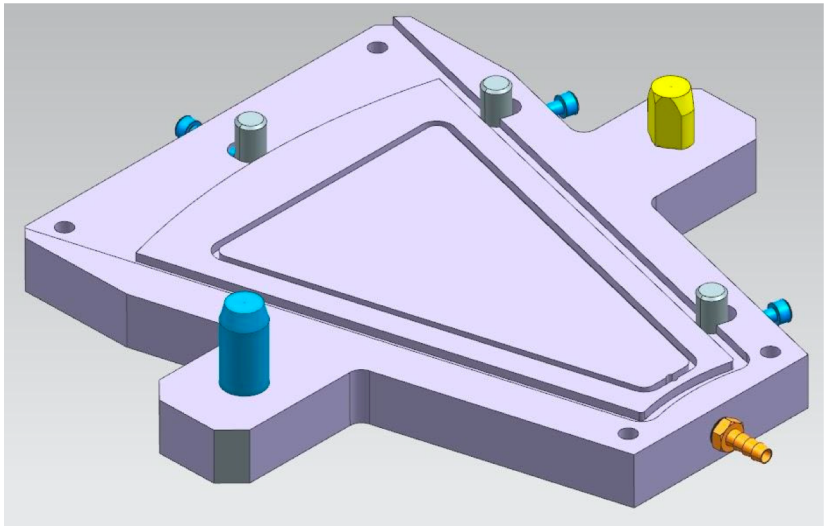


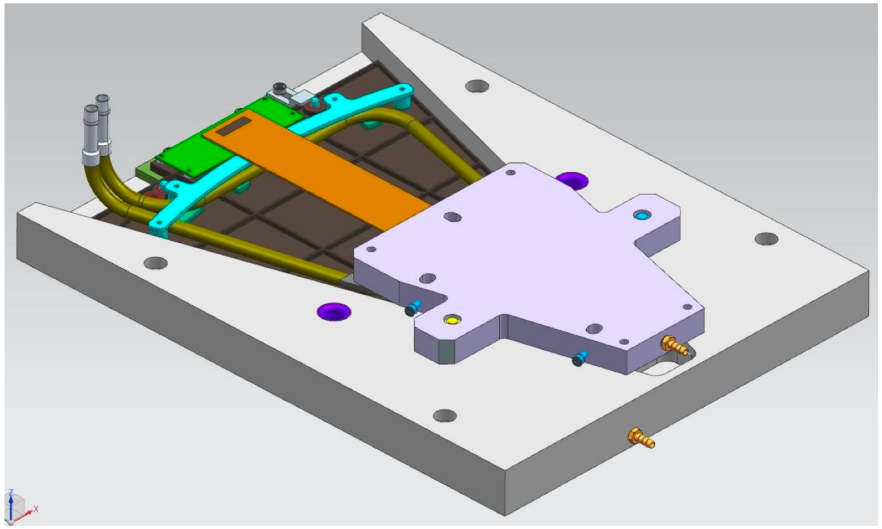
- The two inner thread holes on the mechanical structure will be used as reference points for the assembly.
- Relative positions of the APVs and sensors are determined by
  - dimensions of the pins (<10 μm)
  - dimensions and positions of the pin holes (<20 μm)

STAR FST Module Assembly - Mount APVs and Sensors

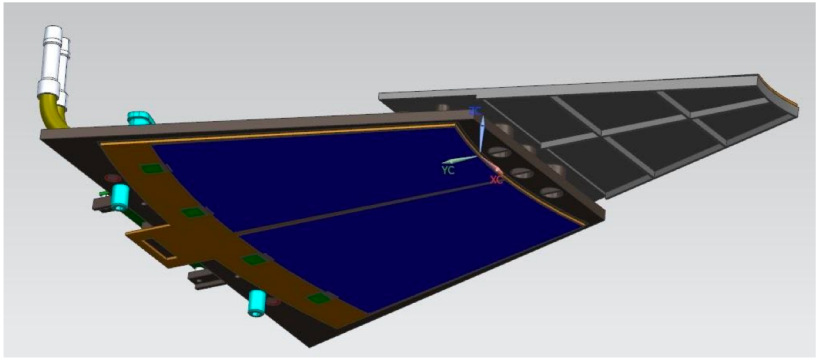


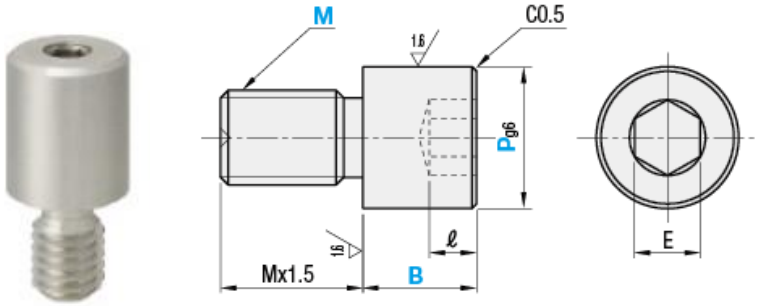


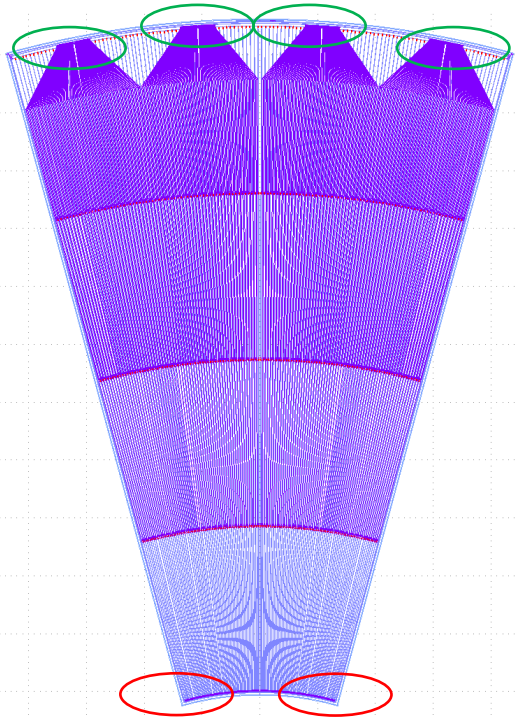




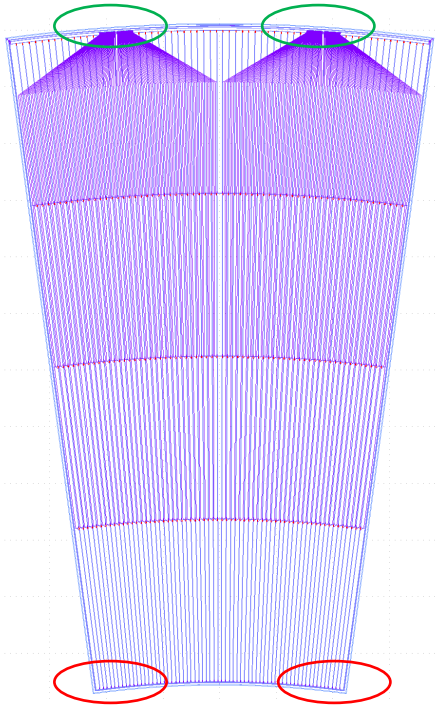
STAR FST Module Assembly - Survey





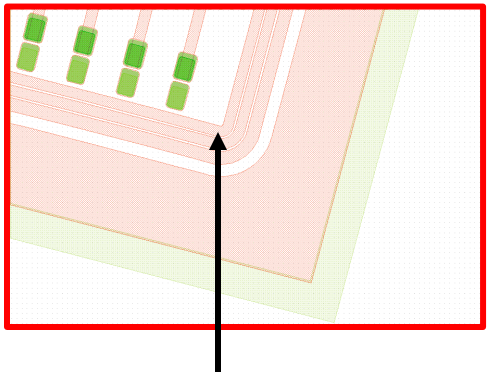


inner sensor

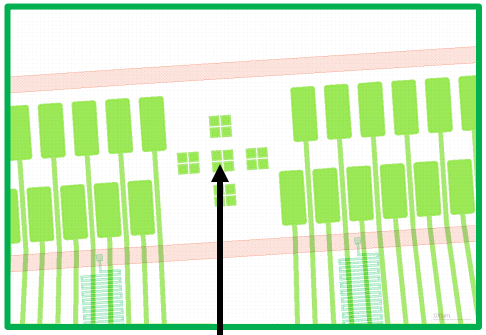


outer sensor

- The center of the two locating pins on the inner thread holes will be used as reference points for the survey.
  - How to relate the measurements of two sides needs some work
- Positions of the following features on the sensors will be measured
  - Corner of the bias ring
  - Center of the readout pad array



Bias ring corner



Pad array center

Prototype Module Assembly – Potential Issues and Schedule

- Mounting and wire-bonding APVs by **Friday March 6 if no issue**
  - hybrid bonding quality
  - dimension and relative position of the hybrid on the mechanical structure
- Mounting and wire-bonding sensors by **Friday March 13 if no issue**
  - flatness of the surface area underneath the sensors
  - dimension and relative position of the hybrid on the mechanical structure