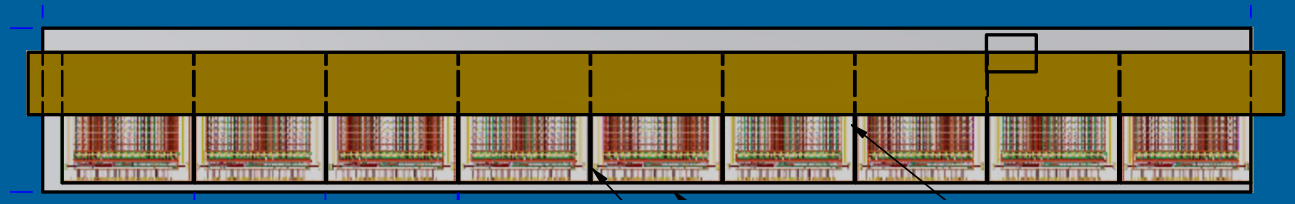
ePIC BIC General Meeting

BIC - Astropix Module



Manoj Jadhav
Argonne National Laboratory

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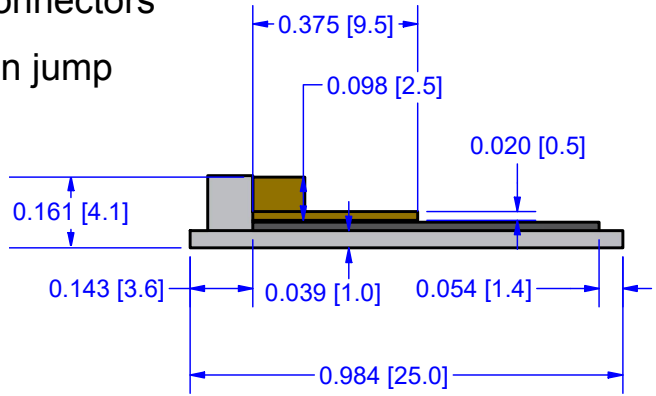
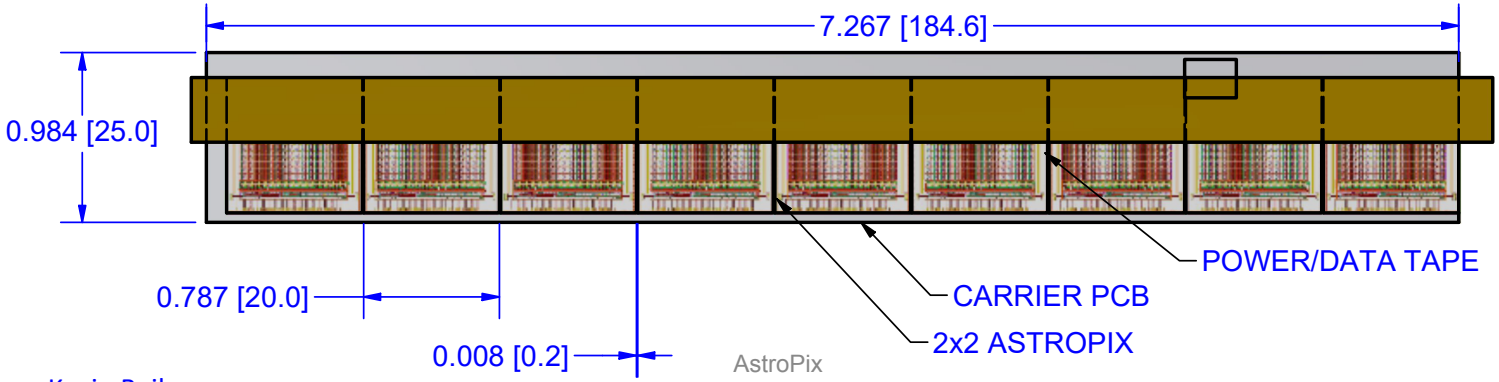
AstroPix Module Specification Updates

- Sector length
  - 436.5 cm (no longer than 440 cm as the upper limit)
  - 15 cm end-of-sector box
- Modules contain 9 AstroPix chips (2 cm x 2 cm) [instead of 8 chips and 13 Modules]
- A total of 12 Modules per Stave → 108 chips → length of Stave is 218.16 cm
  - Provides full coverage
- The current AstroPix v3 size is (1.87 cm x 1.9575 cm)
  - AstroPix v5 to be a full-size chip (~2 cm x 2 cm)
- Discussed different design options for the AstroPix Module
  - Minimizing dead area
  - Bus bar design options
  - Type of LDOs and connector choice
- Next Module Meeting - integration specification

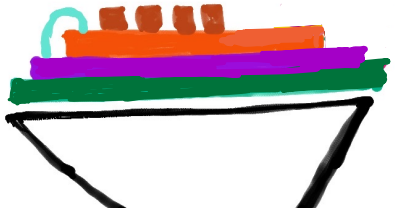
AstroPix Module CAD Design

- First CAD Design
  - Includes 9 chips, Flex bus tape, Carrier PCB, Right-angle connectors
- Flex bus tape - power distribution, module-to-module daisy-chain jump
  - Another option is a **cable harness** (less dead area)
- Design challenges
  - Long flex bus → Short Flex bus attached using a connector
  - The dead area around the top and bottom of the chip-array
- A few more designs are discussed (next slide)





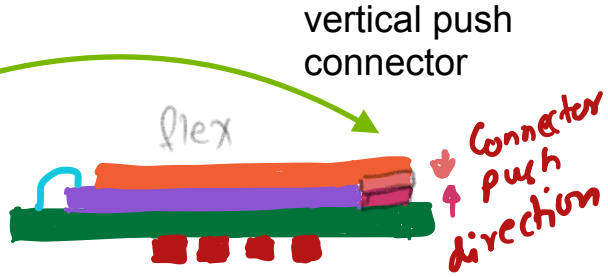
AstroPix Module Design

1. 

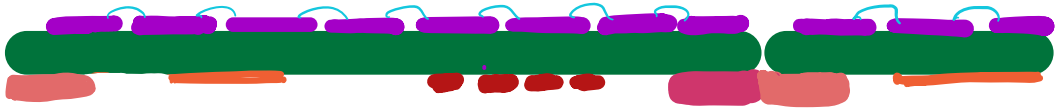
Stave-length bus tape
Can use short connected flex bus
- The drawback is multiple connectors

2. CAD (slide 3)

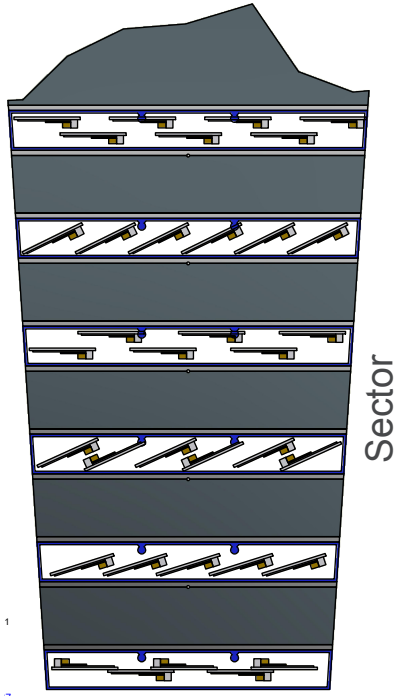
OR



Narrow connectors to minimize dead area

3. 

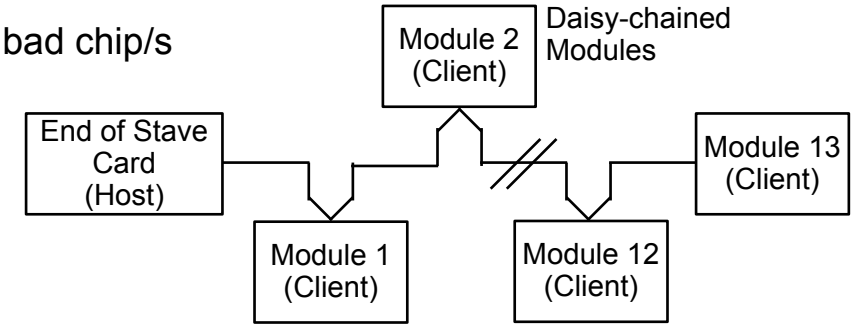
The SPI connection at the edge chip needs to be figured out.
- Various options avaialble to connect two Modules



Goal:
- Minimum dead area on one side of the module
  - Stave integration for full acceptance (future discussion)
- Avoid dead areas in between modules

AstroPix Module Data Transmission

- Are we daisy-chaining the entire stave?
  - Not preferred option
  - Risk of losing an entire row due to a single/few bad chip/s
  - Flex bus alignment might be an issue
- What are our options?
  - Differential SPI (KIT confirmed - ePIC meeting)
  - Multi-drop data transmission using flex bus
  - Daisy-chained chips on the module will be parallel to chips on other modules.
  - Master End-of-Stave will connect to slave Modules through daisy-chain (LVDS on Modules)
- Module enable control
  - Allows to control Module operation individually
  - This will allow to save stave by switching off bad Module

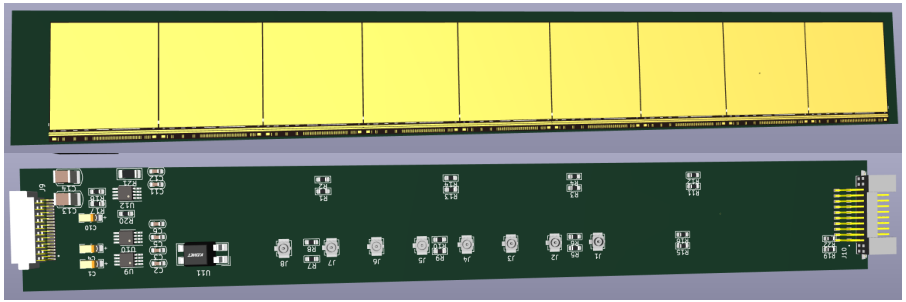


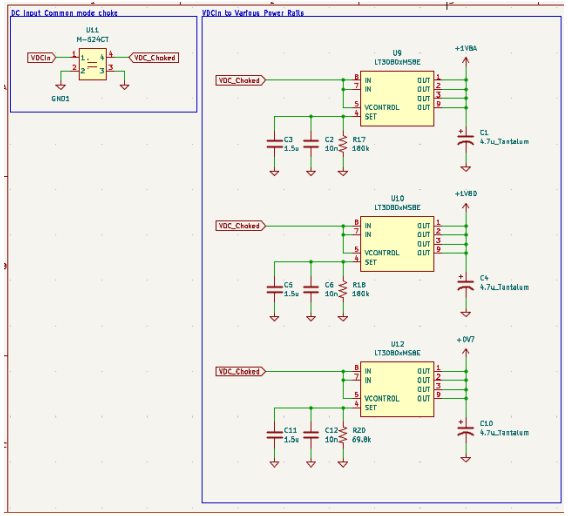
AstroPix Module Connector & LDO options

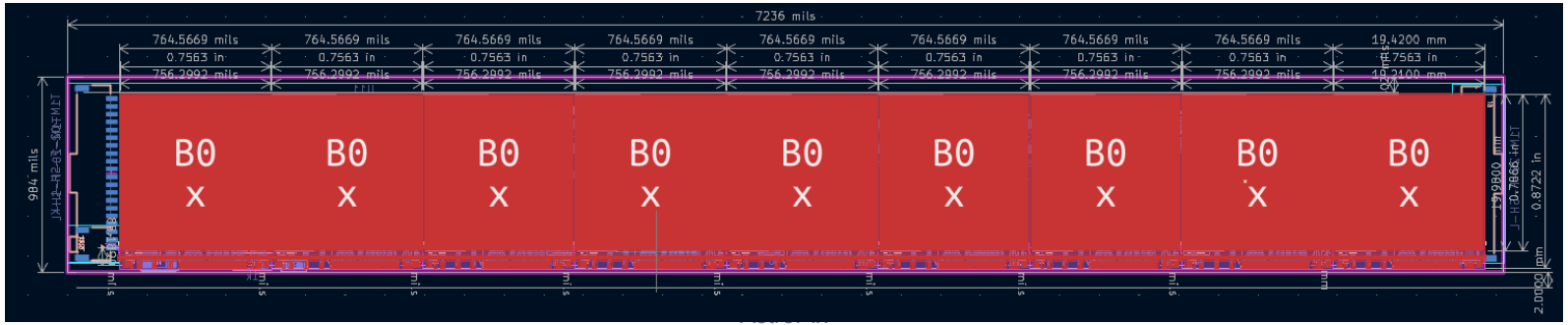
- Connector for Flex bus to Carrier PCB
  - Vertical vs. Horizontal Connectors (Module Option 2 - Slide 4)
  - Narrower connector to minimize dead area above the chip on the Module
  - Flexible connector with cable harness instead of flex bus
- The connector between two Modules
  - Right angle connector
- Connector Suggestions
  - BTH, ERM8, ERM8_RA, LSHM_DA, LSHM_DV (Steven)
  - SFMH-110-02-L-D-LC, FSH-110-04-L-DH-SL (Taylor)
- Options for LDO
  - LT3041, LT3097, LT3045 (Steven)
  - LT3080 (Taylor)

AstroPix Module PCB test design

- PCB test Module
  - Similar to the AstroPix Module to test working
  - Additional space for wire bonds, connectors, more I/O lines







Summary

- Module Design
  - Two main options - Option 2 (vertical connector) & Option 3 (flex attach for Module to Module)
  - Differential SPI, Multi-drop data transmission
  - Check risk factors for SPI failure
  - First test version - PCB test Module
- Connectors
  - Different options are available
  - Selection of the best option according to Module design
- LDOs
  - Few options available - yet to discuss
- Sector Integrations
  - Check for available space
  - Stave integration on the Tray

Thank you

AstroPix Module Block Diagram