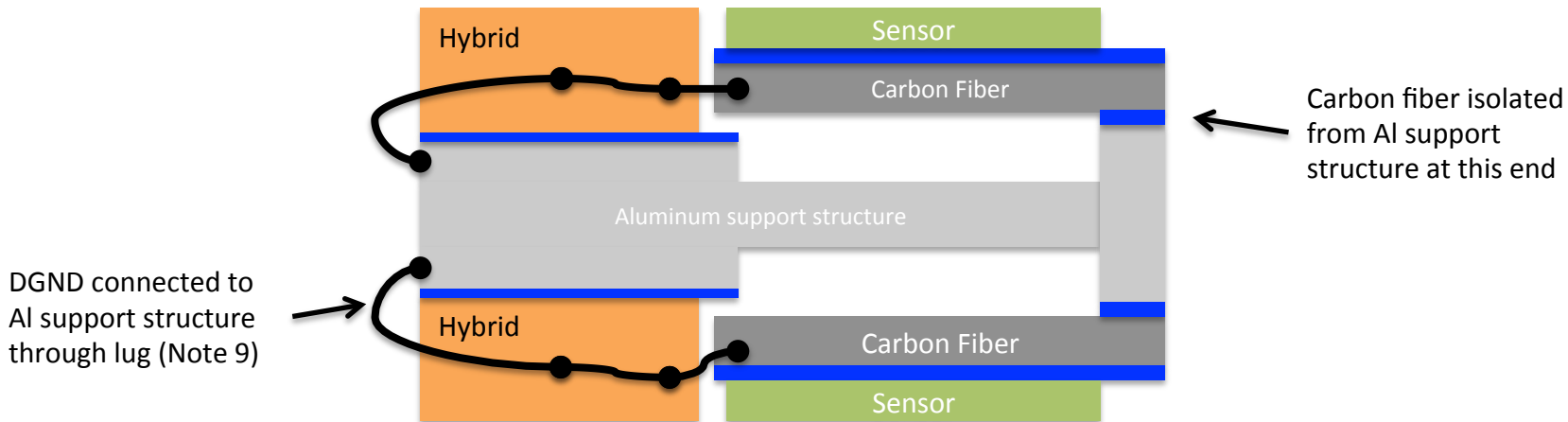


Modules in layers 4-6

Modules in layers 1-3



# General G&S concept

- General concept: world ground is at each hybrid
  - AGND and DGND tied together on hybrid
  - All hybrids tied to support structure
  - Approximation due to intermediate power supplies (Front End Boards (FEB))
    - FEB tie together GND for 3 or 4 hybrids
    - GND from each hybrid are tied to FEB GND using inductors
  - Front end boards are isolated from support structure
  - Support structure are tied to vacuum chamber wall with one single GND tie at the power flange
  - Power supplies are floating and referenced to FEB GND
  - Common shield (braid) of all power cables from PS source tied to common GND at power flange
- Notes
  - Defeat AC noise to propagate between hybrid on same FEB with inductors
  - Prevents GND currents to run through support structure by isolating FEB from support structure
  - DC GND loop between hybrids sharing FEB exist; not expecting to be a problem

# Notes

- Note 1:  
Hybrid AGND tightly tied to Al module support structure through a screw. All modules are tied together through the common module support structure.
- Note 2:  
The module support structure are tied through large Al surface area to tracker Al support box.
- Note 3:  
The tracker support box is isolated from the vacuum chamber.
- Note 4:  
The signal flange boards are isolated from the vacuum chamber walls. Isolate GND of the 3 FEBs served from each flange board by adding a resistor between them on the signal flange board.
- Note 5:  
Shield 1 (braid) provide the single tie from support structure to vacuum chamber wall. It's tied to support structure (through patch panel) at one end and vacuum chamber wall (at power flange) at the other. Shield is isolated from the vacuum chamber except at flange end where the single tie is located.
- Note 6:  
Shield 2 (braid) is attached to shield 1 close to chamber. It is not tied to the \*signal\* vacuum flange.
- Note 7:  
Power cables between patch panel and FEB are shielded with braid tied to support structure through the patch panel
- Note 8:  
Flex cables between FEB and hybrids would ideally be shielded. Most likely this will be hard since we need them to make sharp turns.
- Note 9:  
L1-3 half-modules are isolated from Al support structure but a lug, connected to DGND, in the pigtail is tied to support structure.
- Note 10:  
The mini-SAS cable carrying high-speed differential signals from up to three FEB to the same signal flange board has a shield. That shield is connected to DGND on the FEB through the mini-SAS connector. The shields from each high-speed cable go through a 100Ohm resistor before connecting to the floating PS GND, this defeats any standing current between any of the FEBs (see Note 4 as well).

# Options/needed modifications

- Needed modifications
  - FEB
    - Add extra jumpered layer connecting AGND to holes allowing option to connect AGND to support structure
  - Signal flange board
    - Add resistors to isolate mini-SAS shield GNDs.
- Options
  - Tie FEB to support structure (see mod. above)
  - Isolate hybrids from support structure
    - L1-3: do not connect lug to support structure
    - L4-6: use peek screw