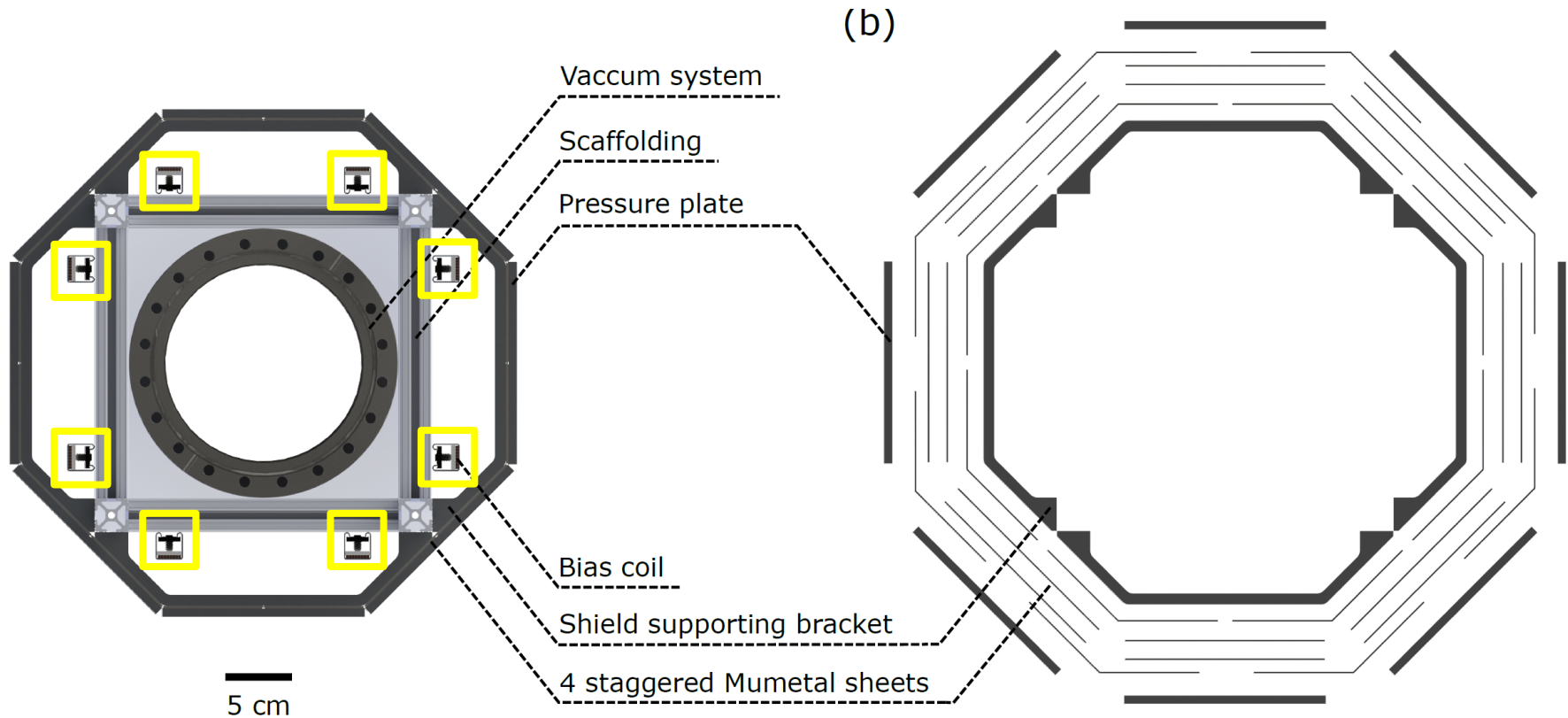


Vertical bias bars

Modular connection node workshop

Jason Hogan
June 30, 2022

Vertical bias bars



- 8 bars per modular section (two sets of 4 bar, forming Helmholtz coils)
- 4 bars produce horizontal bias field for interferometry
- Positions inside shield chosen to maximize field uniformity (accounting for image currents in shield)
- Should be uniform along the 100 meter baseline

Design questions

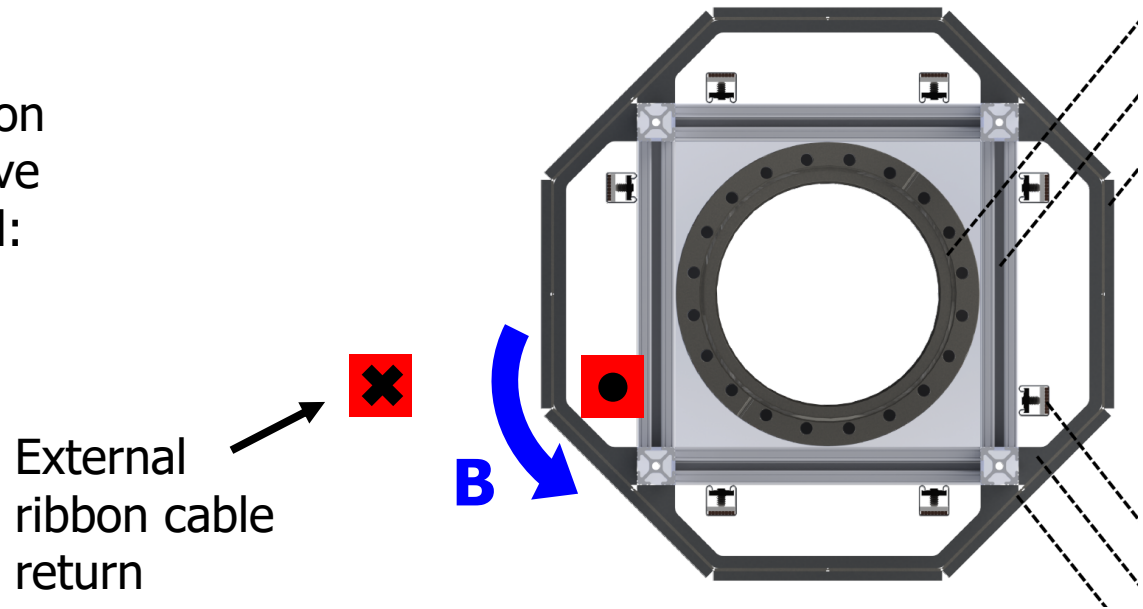
- Independent control of modules, or connected in series?
 - Provisional plan is to use series → two 50 meter bias bar sections
- Electrical connections between modules
- Conflicts with connection node chamber, cameras, etc.
- Degaussing procedure
- Manufacturing approach

Connections and Conflicts

- There must be gaps in bias bars between modules so that adjacent modules do not conflict during installation
- Add short “jumper” bias bar pieces after installation to bridge gap?
- Connector solution required: many turns, 8 bias bar jumpers, 4 connectors per jumper...
- Needs compliance to allow for module-to-module misalignment
- Needs to avoid conflicts with vacuum cross while maintaining vertical geometry
 - Small adjustments of location of bars is possible
 - Bar geometry/cross section depends on manufacture approach

Degaussing shield

Use temporary connection outside the shield to drive azimuthal magnetic field:



All 50 meters together

- Faster/easier
- Degausses closed couplers
- Larger power requirement (variac size)
- Larger inductance

Each module independently

- More effort
- Couplers open during degauss
- Less power, lower inductance
- More control of each module? Cross talk?
- Connectors needed at connection nodes

Manufacturing bias bars

Magnet wire (prototype design)

- Aluminum u-channel guides
- 8 turns, polyimide-coated square magnet wires
- Clamps along length to secure wires
- Build by tensioning all wires with jig, then installed in u-channel and clamped

Ribbon cable

- Less effort to wind
- Lower turn density
- Temperature issues during bake?
- Use ribbon crimp connectors?

Continuous wire design (?)

- 50-meter long, continuous conductors for each bar (2 sections total)
- Install empty pipes during module assembly (“conduits”)
- Pull conductor bundles through conduits **after** all modules installation
- Avoids need for jumper wire sections, no need for connectors
- Requires work in shaft, hard to access all 8 bars