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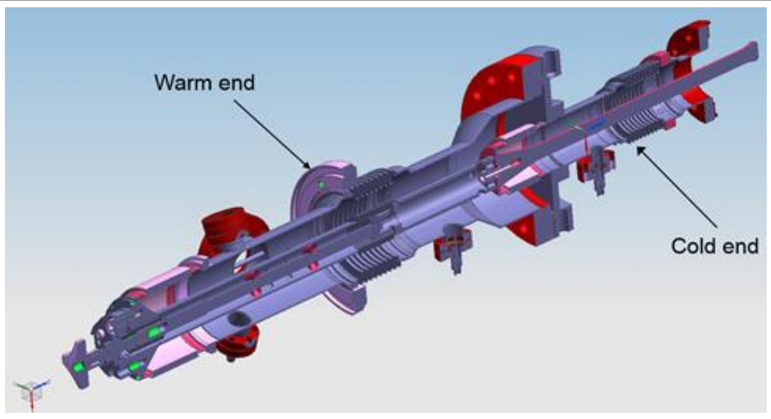
LCLS-II FUNDAMENTAL POWER COUPLER MECHANICAL INTEGRATION

Details of thermal straps, connections, and other interfaces

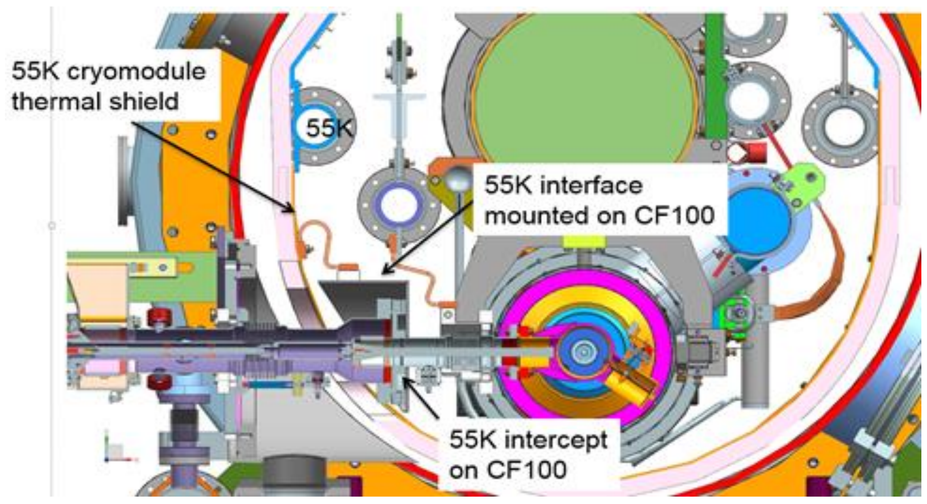
K. Premo, T. Arkan, Y. Orlov, N. Solyak

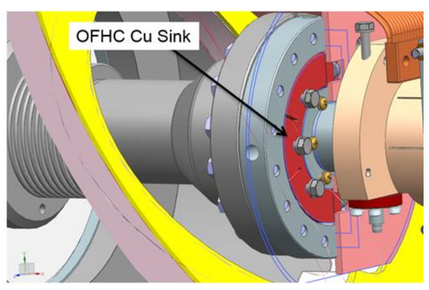
Fermi National Accelerator Laboratory, Batavia, IL 60510, USA



Modifications/Design changes (differences from TTF3)

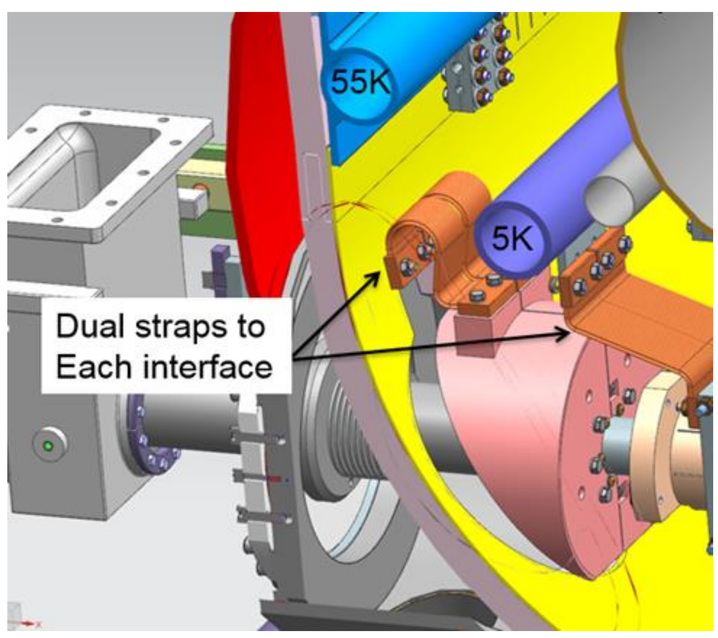
- Cold end
  - Antenna length shortened by 8.5mm
  - CF100 55K interface mounting surface increased
    - Diameter increased from 64mm-78mm, mounting area almost doubled
    - Bolt size increased from M4 to M6 to improve clamping force (> 2x)
  - Holes for temperature sensors added to CF100 flange
- Warm end
  - Increased Cu plating thickness on inner conductor
    - Increased from 30 micron to 150 micron to reduce bellows temperature
  - Additional threaded hole to be added for transportation support



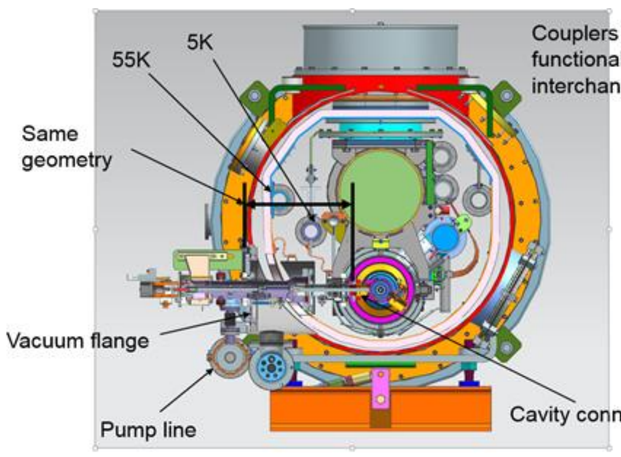


Thermal interfaces to cryomodule

- 55K intercept interface design
  - Design concept similar to ILC type and XFEL
  - Interface consists of aluminum shield bolted to back of CF100 flange using M6 screws
  - Design will use high performance engineered OFHC Cu straps
  - 2 straps take heat to 55K outer shield
  - Bolted connections will utilize indium for better thermal contact



- High performance engineered OFHC Cu straps
  - OFHC copper for high conductance at low temps
  - Standard part from company catalogue, length to spec
  - Good flexibility and durability
  - Solder free with very low outgassing

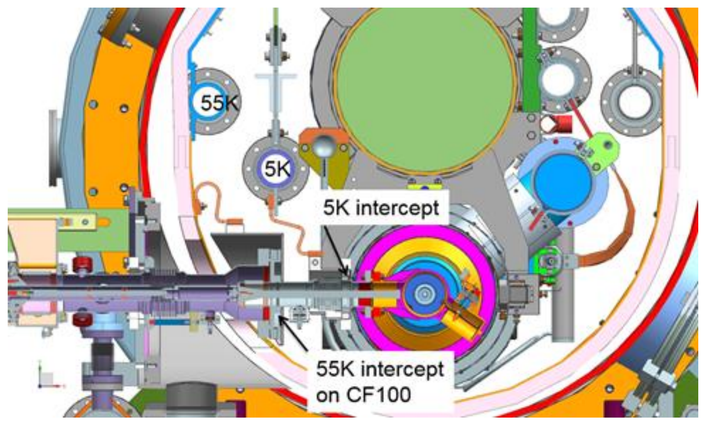


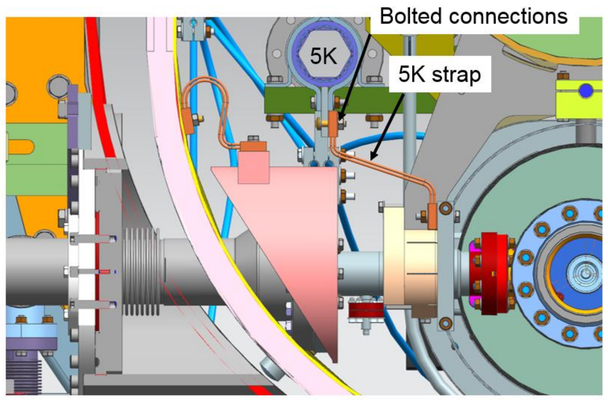
Integration into cryomodule

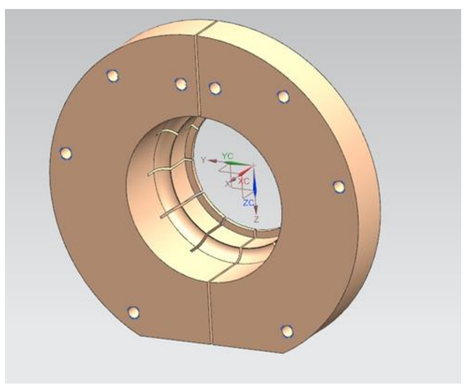
- Integration into cryomodule is the similar to ILC, XFEL
- Same coupler geometry as ILC and CM2
  - Lengths of cold and warm sections are the same
  - Same flanged connections
  - Very similar installation procedure
  - Coupler warm end vacuum by common pumping line
- Couplers are functionally interchangeable

Thermal interfaces to cryomodule

- Location of thermal intercepts on the couplers has not changed from TTF3 type
- There are two coupler thermal interfaces to cryomodule
  - 5K intercept on cold end (between bellows and cavity flange)
  - 55K intercept on cold end CF100 flange
- CW operation requires improved heat transfer away from coupler, from both the 5K and 55K intercepts





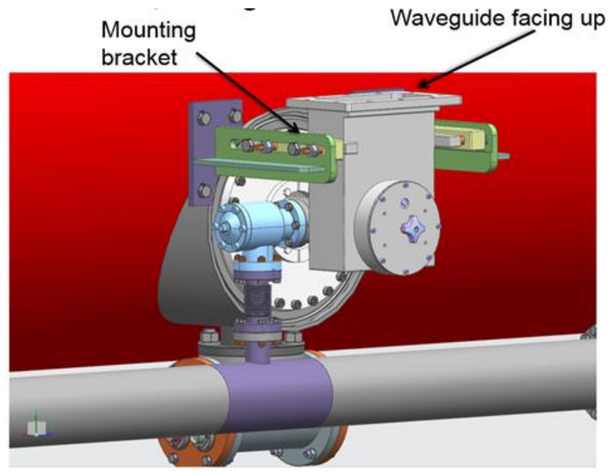


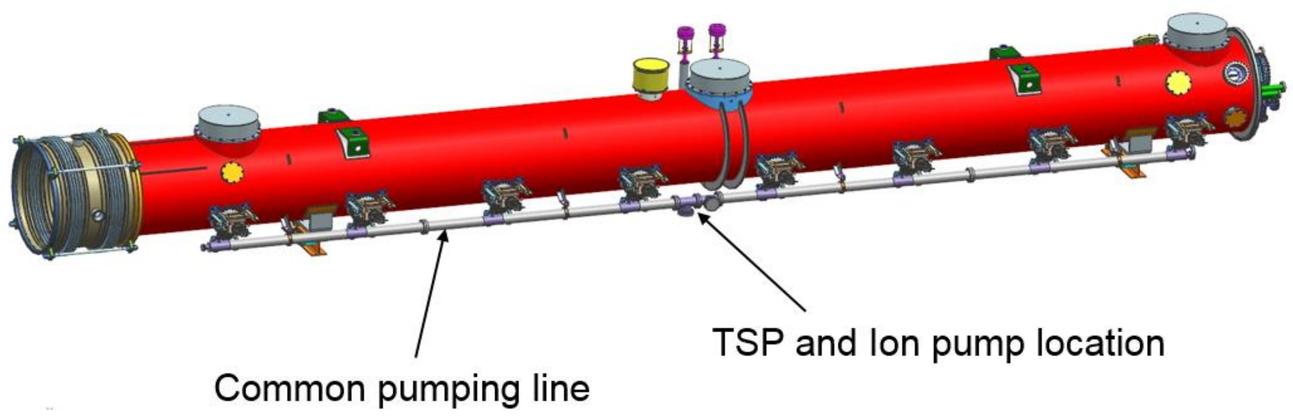
5K intercept

- Interface design
  - 5K coupler interface clamped to coupler intercept (copper ring)
  - Design will use high performance engineered OFHC Cu straps
    - 2 Cu straps take heat to 5K line via bolted connection
    - Connections will utilize indium for better thermal contact

Waveguide and pumping line configuration

- Same waveguide interface configuration as ILC Waveguide oriented facing upwards
- Waveguide has been value engineered by SLAC in order to reduce cost, new design material is aluminum
- Couplers use common pumping line
- All metal valves allow coupler isolation for repair
- TSP and Ion pump centrally located





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