PIP-II SSR Solenoid Current Leads

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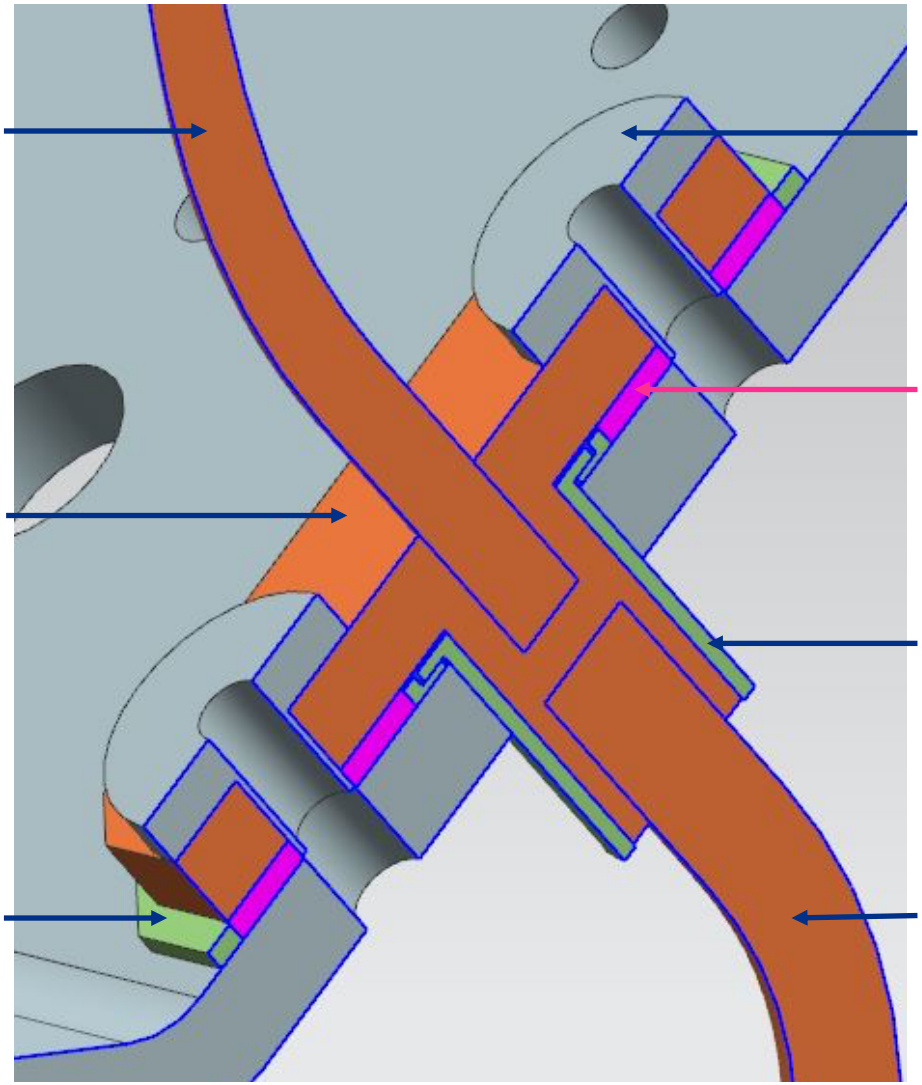
Proposed solution – “Sapphire sandwich”

Copper jump
Provides electrical path between feedthrough and HTS lead

Copper feedthrough
Provides electrical path between resistive lead to copper jump

G10 retainer plate
Holds sapphire in place and electrically insulates feedthrough from shield



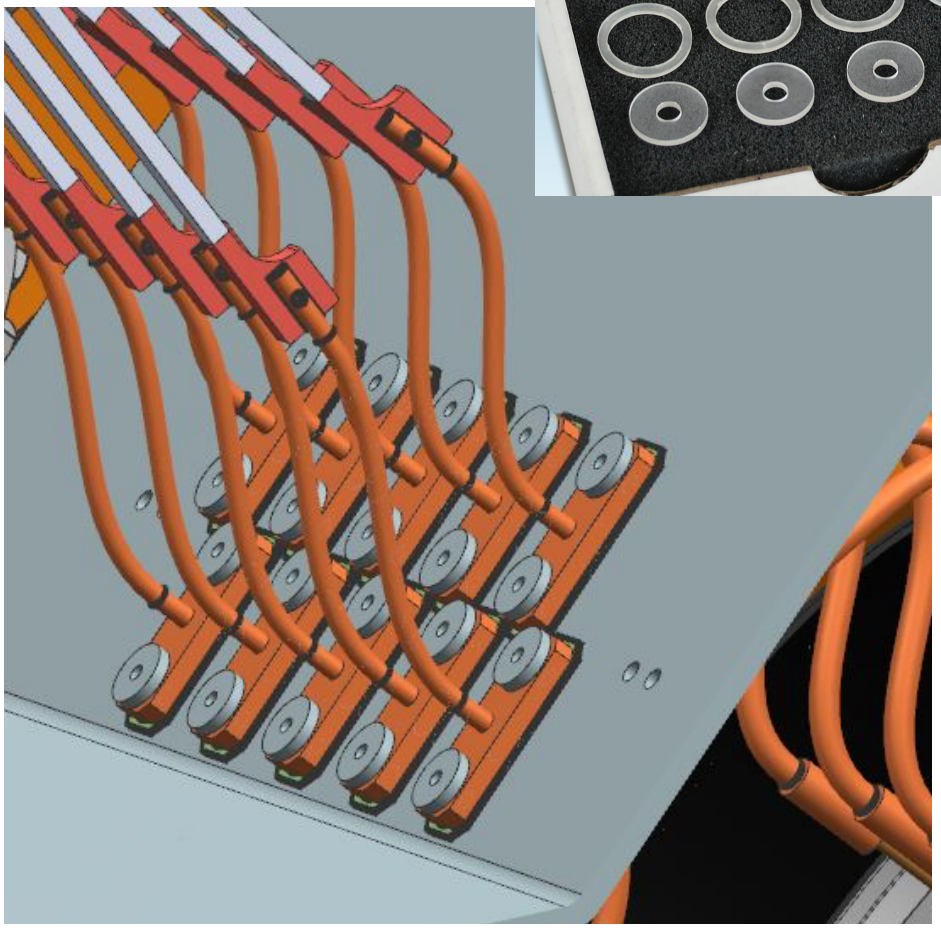
Insulating bushing
Electrically insulates hardware from feedthrough

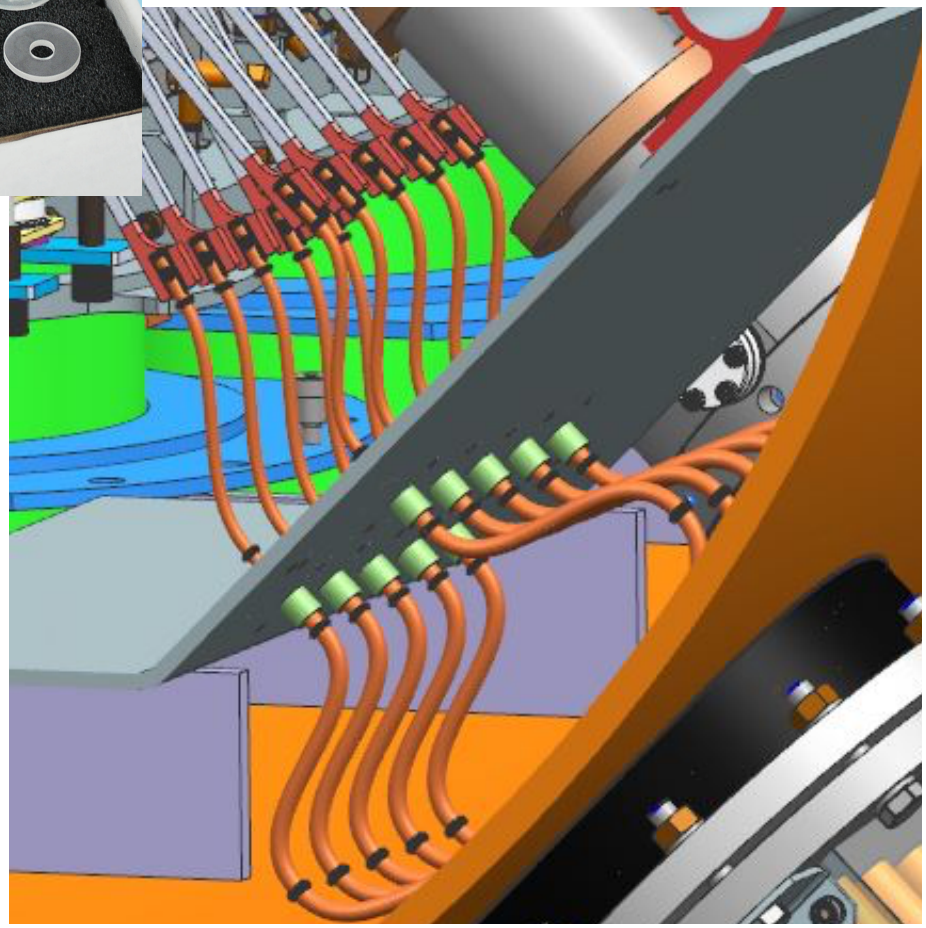
Sapphire disc
Provides thermal path while maintaining electrical insulation

G10 sleeve
Electrically insulates feedthrough from shield

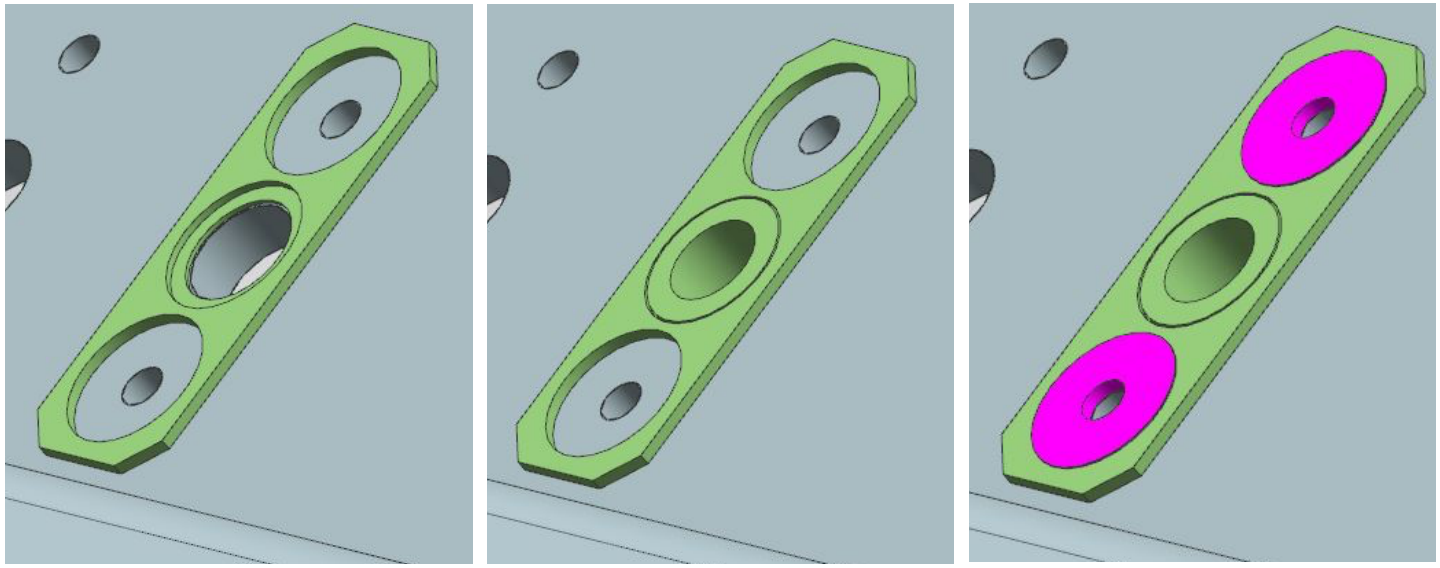
Phosphor bronze resistive leads

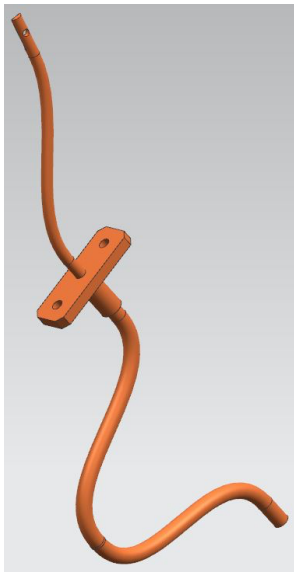
“Sapphire sandwich” system view

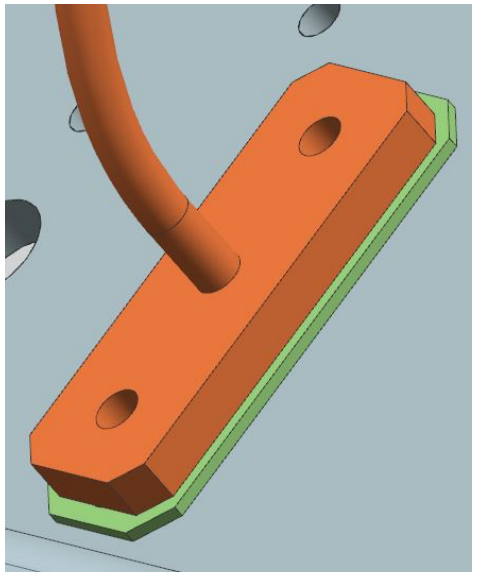


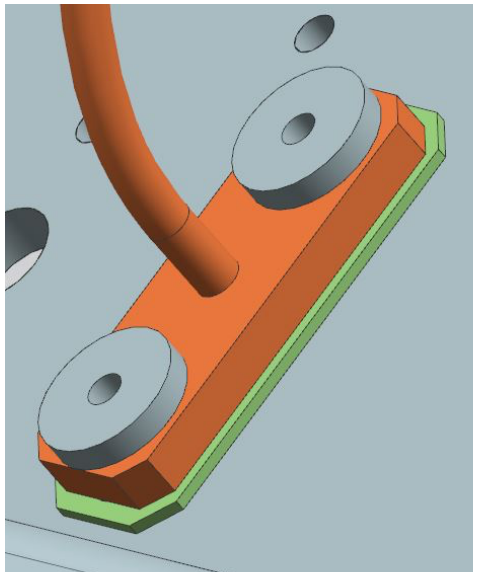


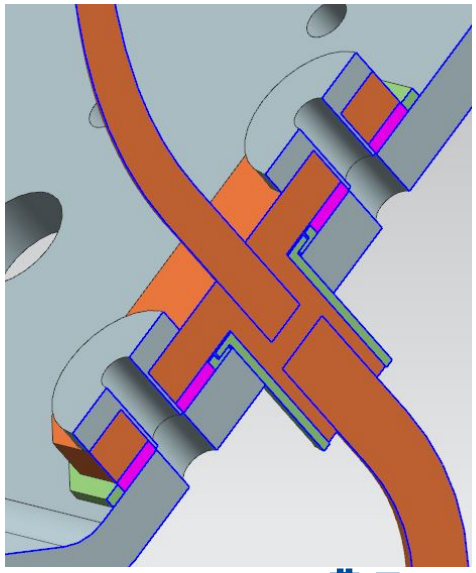
“Sapphire sandwich” assembly steps



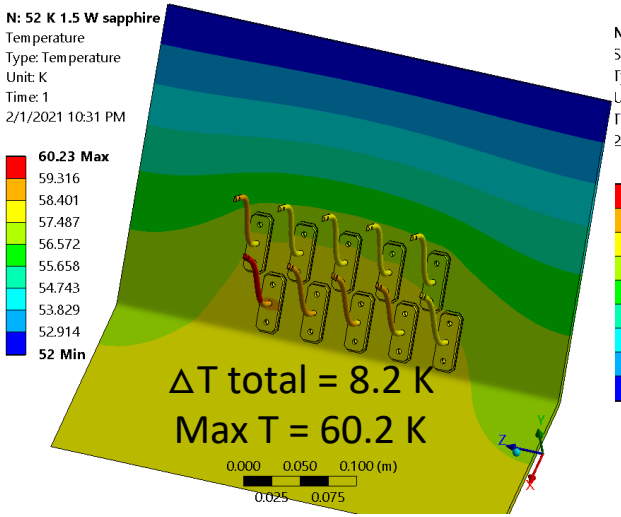


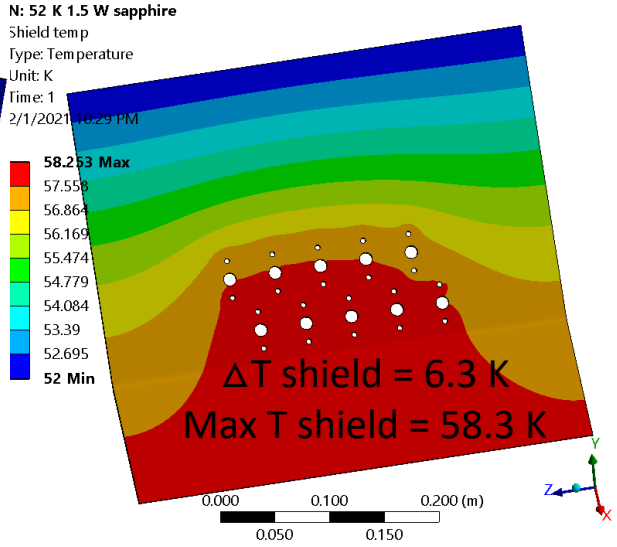


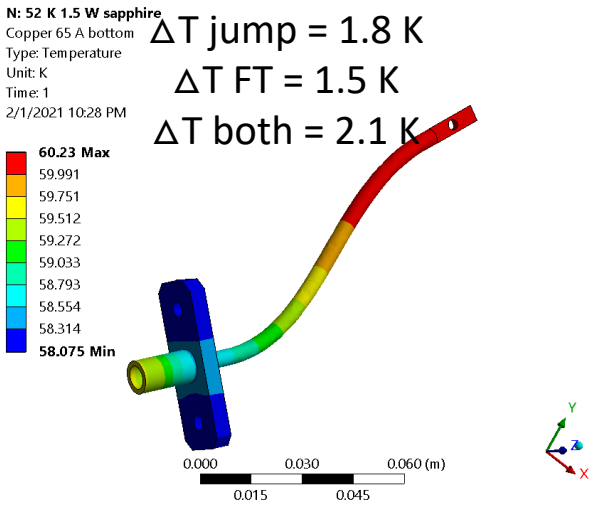


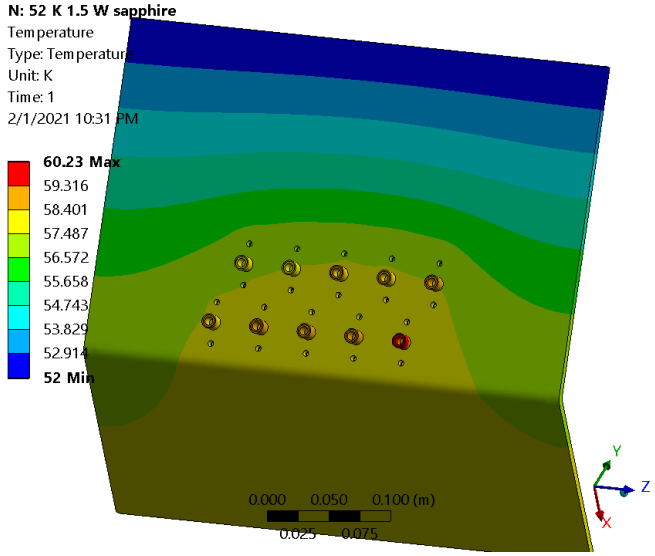


“Sapphire sandwich” – ANSYS simulations





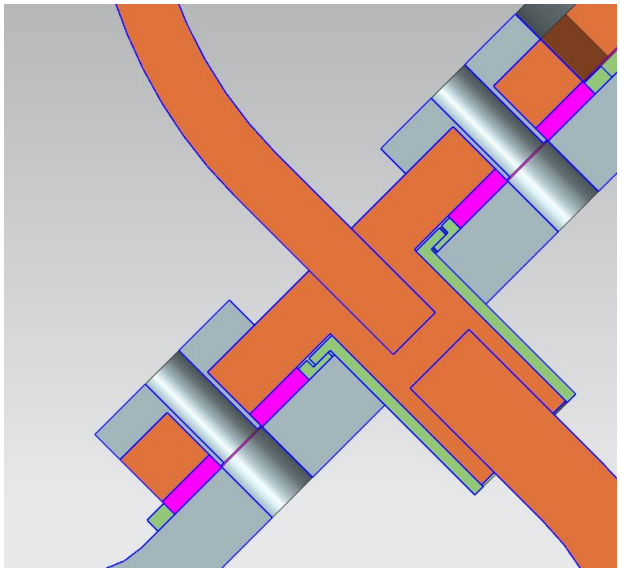


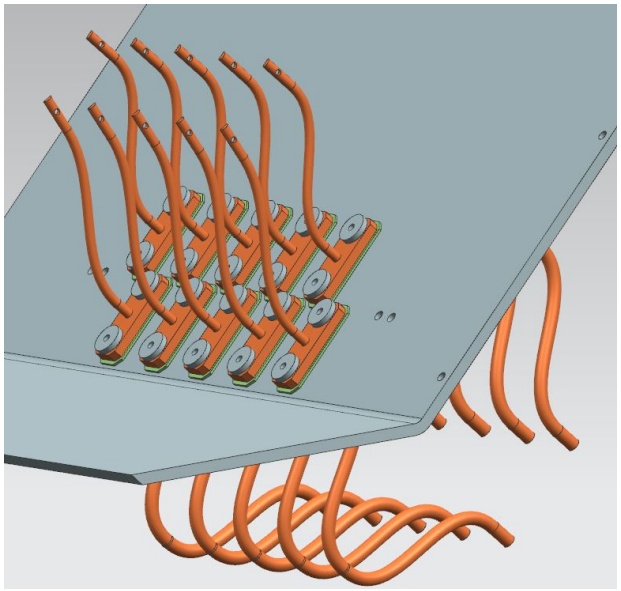


Parameter	Unit	52 K He gas	60 K He gas
Heat load from current leads	W	22.2	22.2
He gas T (shield BC)	K	52.0	60.0
Max T at end of jump	K	60.2	69.2
delT full model	K	8.2	9.2
delT shield	K	6.3	6.8

Conclusion

- Proposed ”sapphire sandwich” design:
  - Maintains HTS temperature at or below 70 K limit with a He gas temperature (or shield temperature at He gas line) of up to 60 K
  - Uses many commercially available components
  - Custom components are simple to manufacture
  - Easy to assemble
  - Inexpensive to produce





Additional images – nomenclature

(1) HTS leads cold end

(2) HTS leads warm end

(3) HTS to shield “jump”

(4) Feedthrough/thermal intercept

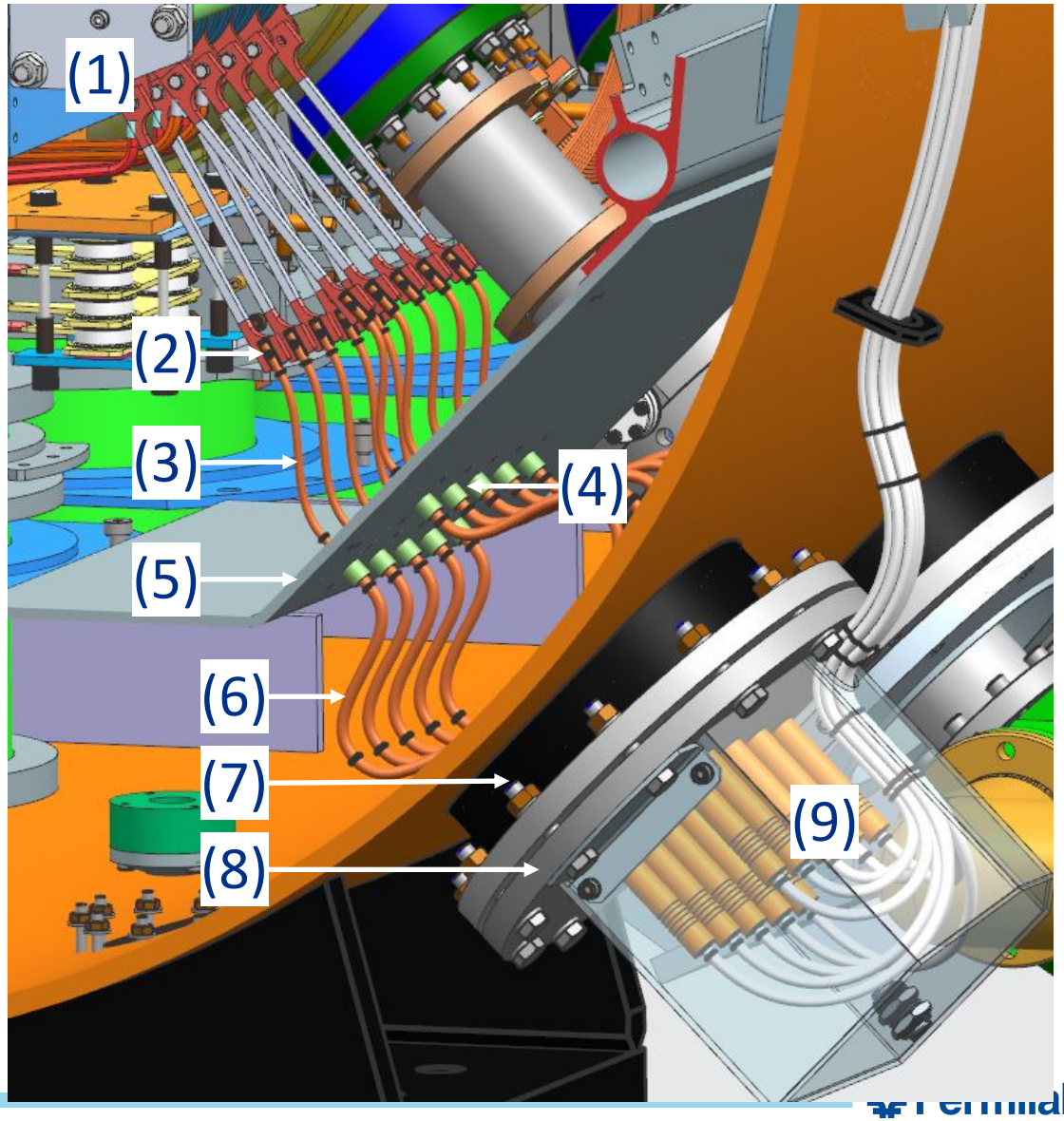
(5) Thermal shield

(6) Resistive lead (phosphor bronze)

(7) Cryostat port

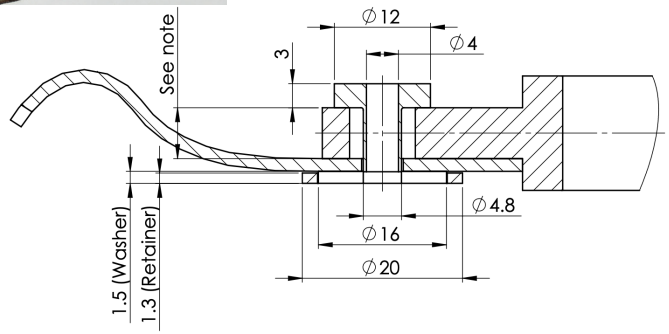
(8) Feedthrough flange

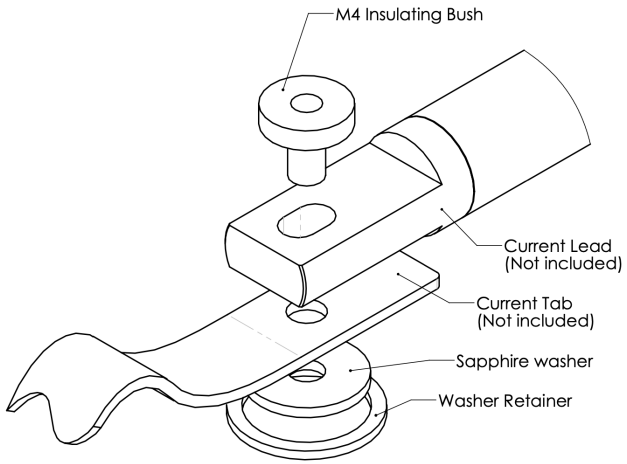
(9) Power cables with plugs

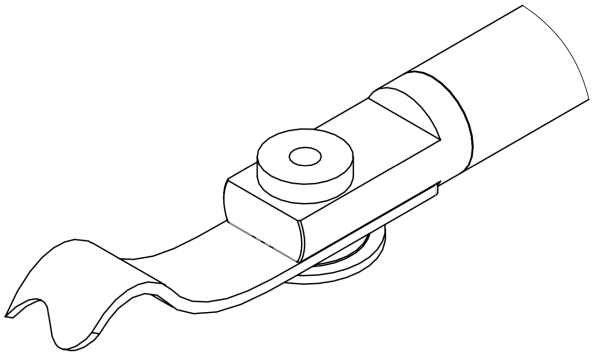


Additional images – sapphire washer kit

Configuration for 150A, 250A and 500A Standard Current Leads.
- Use 1 kit for 1 pair of leads -







Each Sapphire Kit (PN# SK-0150A to SK-0500A) contains:

4 x Sapphire washer
4 x Washer Retainer
4 x M4 Insulating Bush
1 x Sapphire Kit Outline Drawing

Note:
150A - 500A end thickness varies from 3.3 - 6.35mm. See individual current lead outline drawings for specific thickness.

ALL DIMENSIONS ARE IN MILLIMETRES	DO NOT SCALE DRAWING
HTS-110	*CONFIDENTIAL / copyright HTS-110*
	PRODUCT NO. **SK-0150A-0500A**
	Sapphire Kit
www.hts-110.com	DWG NO. **L99000101** A3

Additional images – HTS current leads (HTS-110)