



Cornell Laboratory for
Accelerator-based Sciences and Education (CLASSE)



Embedded Solenoids



Jan. 5, 2011

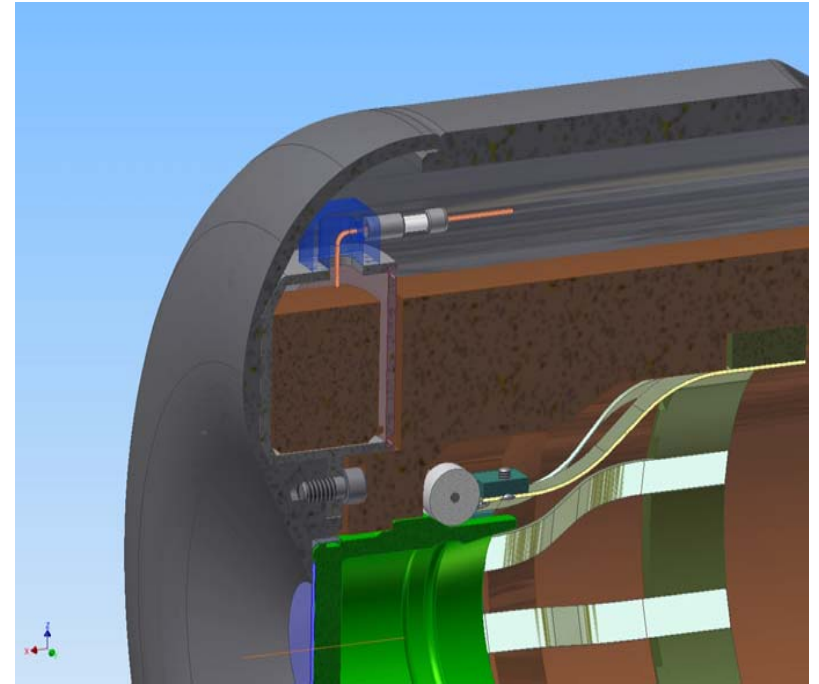
ERL Phase 1B Gun External Review

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Proposed embedded solenoid poses a number of problems:

- Delivering power at HV
- Vacuum encapsulation
- Cooling





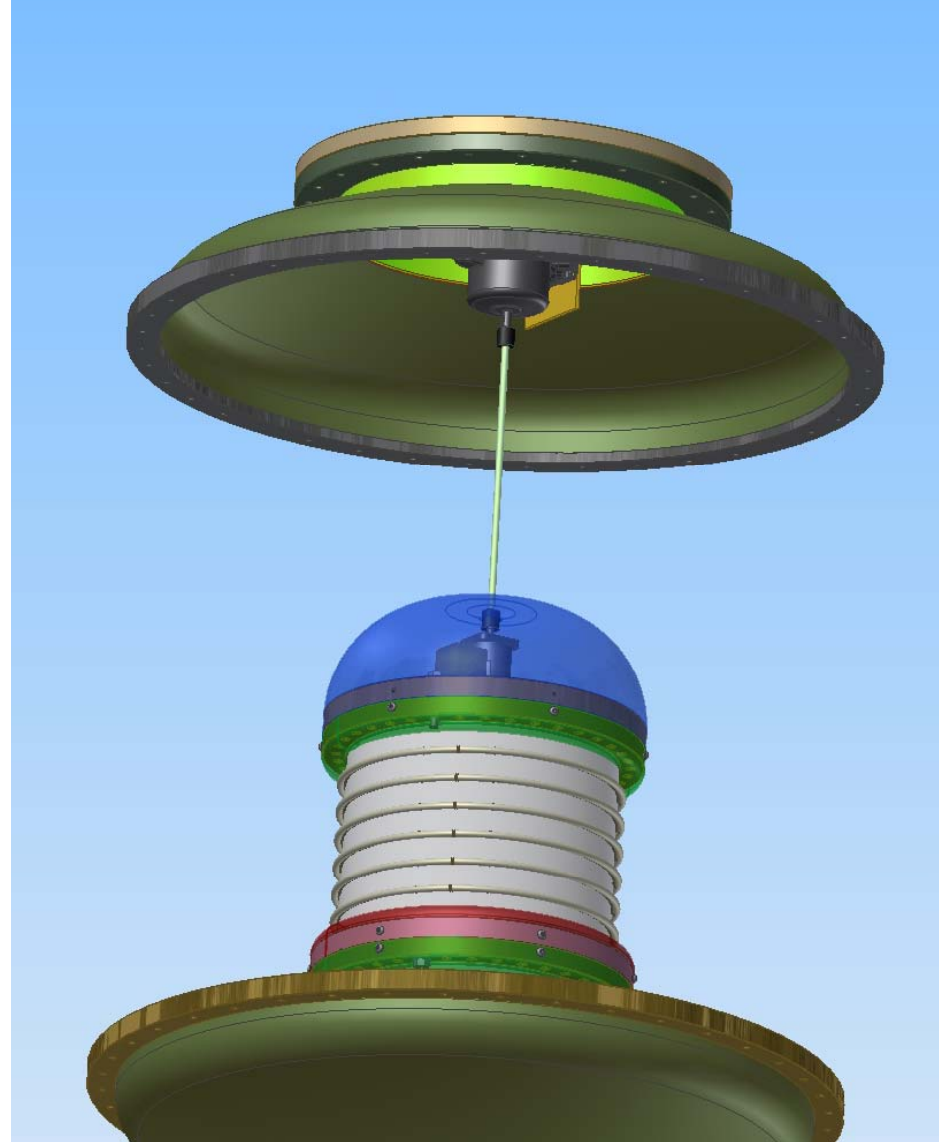
Need to provide 20W to 60W at HV for Solenoid

Options:

- Tap into HVPS – need to approach Kaiser for ideas
- Solar cells – commercial cells giving about $80\text{W}/\text{m}^2$, area of dome almost a square meter
- Fiber optic links (currently used) – a couple watts
- Mechanical drive to generator – 100s of watts



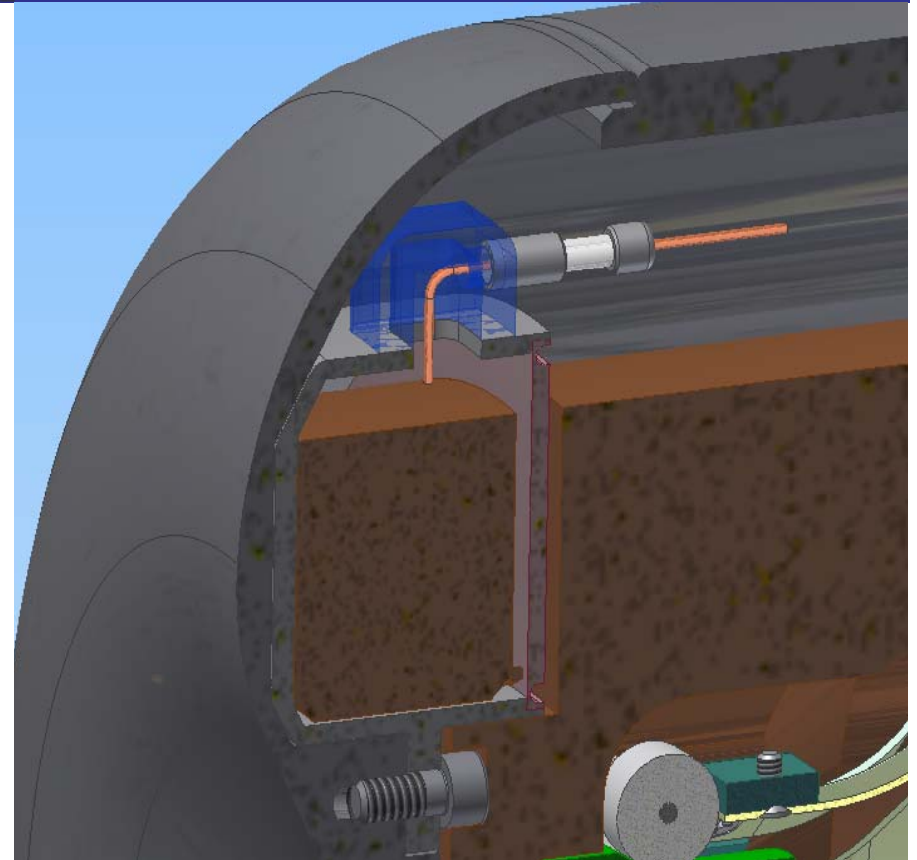
- Mechanical drive to generator – 100s of watts without difficulty
- AC motor mounted within SF6 vessel / External is possible
- Long G-10 rotating drive
- DC generator within dome
- Regulation and appropriate power supply required





Solenoid coil will not meet vacuum requirements due to wire insulation and epoxy potting

- Stainless hermetic vessel to contain coil package (weld details)
- Coil package bonded to housing with thermal epoxy for heat transfer to stalk (*not shown*)
- Ceramic hermetic feedthrus (10A)
- Have experience with bakable epoxies to 250°C
- Evacuate, backfill with rare gas?





- First pass design appears possible
- Makes assembly of system more difficult, with wiring internal to vacuum (bare copper with ceramic beads)
- Additional feed-throughs at HV flange for power
- Stalk designed to incorporate power transmission to minimize difficulty during assembly
- Cooling connection between solenoid package and cooling stalk needs to be designed
- Reliability of in-vacuum electrical connections a risk