

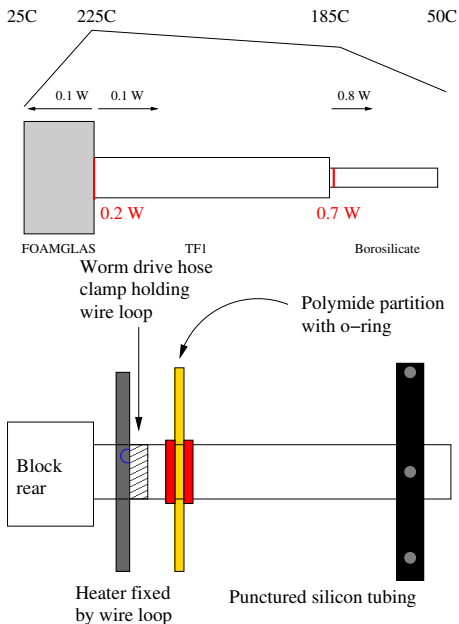
ECal Prototyping Update

Seamus Riordan
seamus@anl.gov



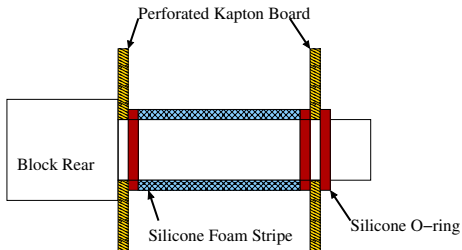
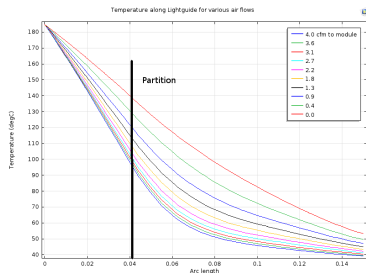
August 30, 2017

Intro



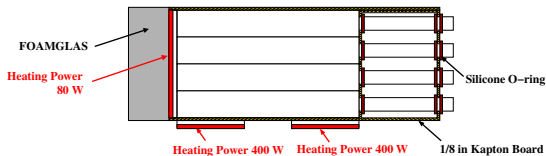
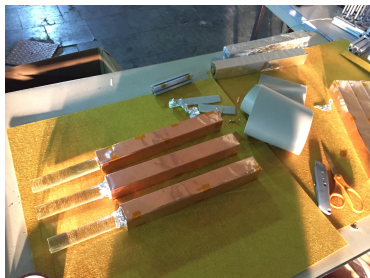
- Prototype presented to DOE included heating at front and rear of blocks
- Heating at rear is dominant component due to heat losses out of lightguide (10 W/block vs 1 W/block in front)
- Attachment of heating elements was tedious and difficult to access once in place

Heating from front concept



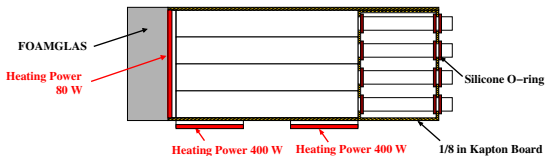
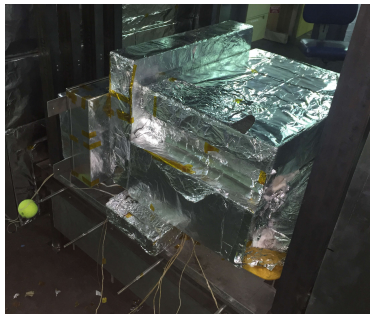
- Few mils of copper foil effectively changes thermal conductivity of system
- Heat gets channeled along sides along length and still has approximately linear gradient
- Cooling from rear should be equivalent with same partition/o-ring system in the back
- Tried out insulating light guides to make losses more linear and controllable

Heating from front test



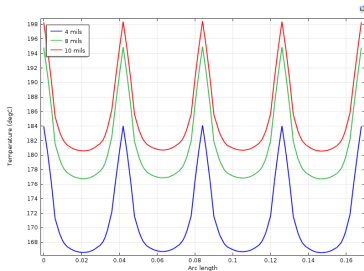
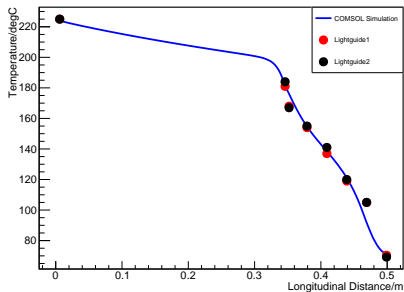
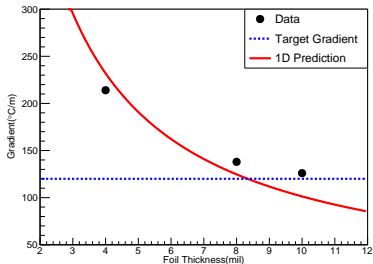
- Work done by Tao Ye at SBU
- Tested wrapping with several different thicknesses
- Used 4×4 configuration - no super modules, no PMTs
- Two partitions with insulated lightguides

Heating from front test



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Results



- Simulation was matched to COMSOL
- Deviates from naive predicted conductivity - 10 mil required vs 6 mil)
- Likely needs to be scaled up in size
- Light guide profile nonlinear - need to test heat sink concept
- Report with details produced

- Blocks will go back to JLab in near future
- Working on NIM paper to summarize all R&D to date
 - Considerable work from outside collaboration by students to be polished
 - Will include transparency, annealing tests, C16, C200