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Producing the Initial State of X1 Cryogenic ICF Targets N.B. ALEXANDER, General Atomics — The proposed X1 Advanced Radiation Source is an enlarged version of Sandia National Laboratories' Z pulsed power facility designed to achieve high yield fusion. The ignition and high gain targets proposed for use in the X1 utilize, in their interior, a spherical shell layer of solid cryogenic DT inside of a capsule. The target's DT layer must be cooled to below 19.7 K to solidify the DT. The thermal environment at the outer surface of the DT layer must be as uniform as the required DT layer uniformity. The heat generated in the DT by its radioactive beta decay and the cylindrical symmetry of the target's outer walls work against meeting these two requirements for producing a target with a DT layer acceptable for imploding. Thermal models were made using X1 target geometry. These show that high gain targets will likely be too hot to solidify the DT layer if the capsule cooling occurs solely via thermal conduction through the foam holding it in place inside of the target. A small amount of helium gas within the foam was shown to provide sufficient conductivity to allow solidification of the DT within the capsule. Too high a density of helium in the foam causes a strong thermal link between the cylindrical target walls and the capsule, which results in a non-uniform DT layer. Models were produced for which the DT layer uniformity and the temperature were acceptable over a reasonable range of helium density.

[X] Prefer Oral Session
[ ] Prefer Poster Session

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