SLC AND NLC POSITRON TARGET DESIGN

ISG5 MEETING, SLAC

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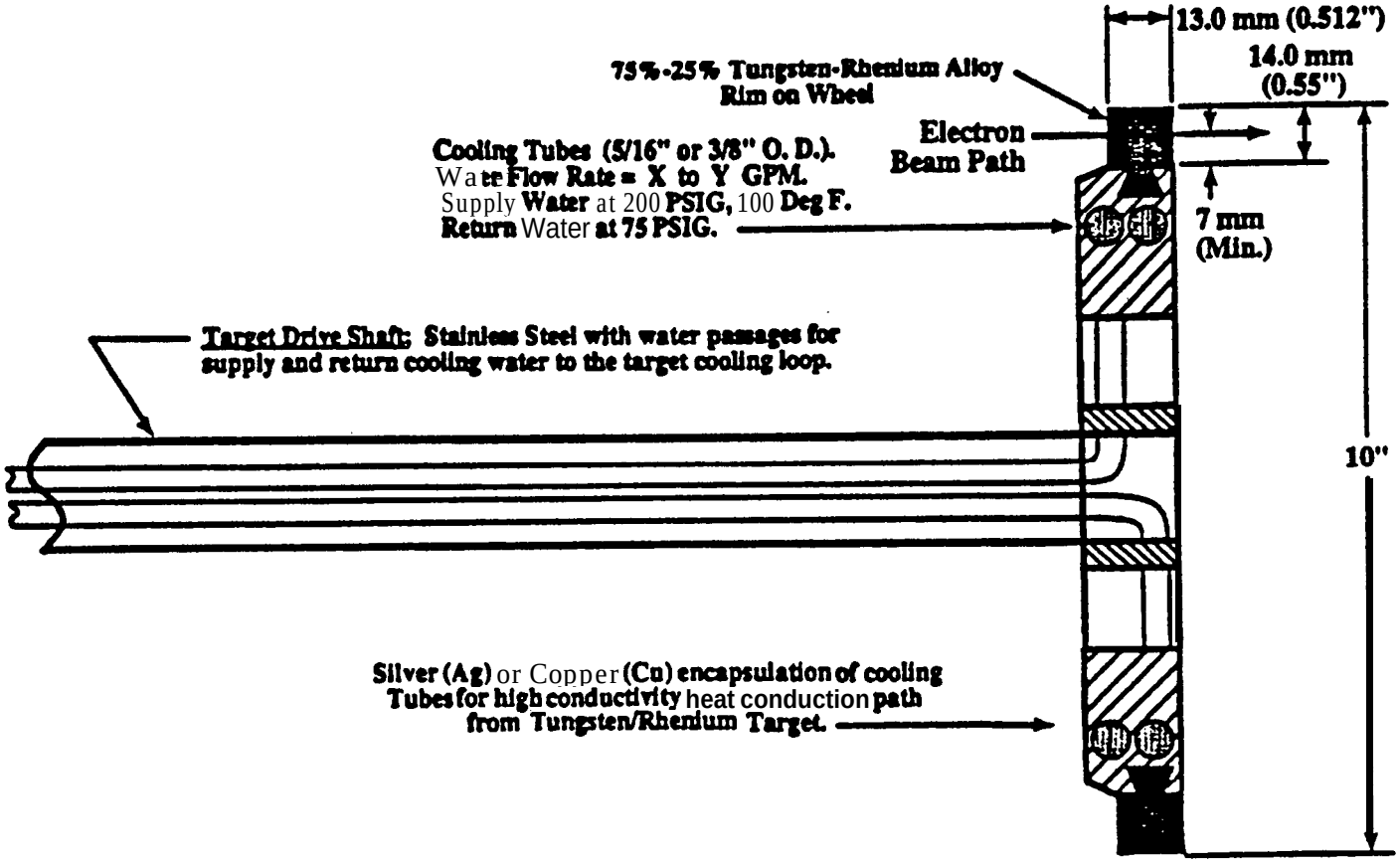
SCHEMATIC OF TARGET



NLC TARGET THERMAL ANALYSIS-CIRCULAR CHANNELS

* Assuming infinite speed rotation and circular coolant channels, an estimate of coolant channel wall temperature was made.

* Beam power of 23 KW assumed.

* Wall temperatures of 290 F are estimated.

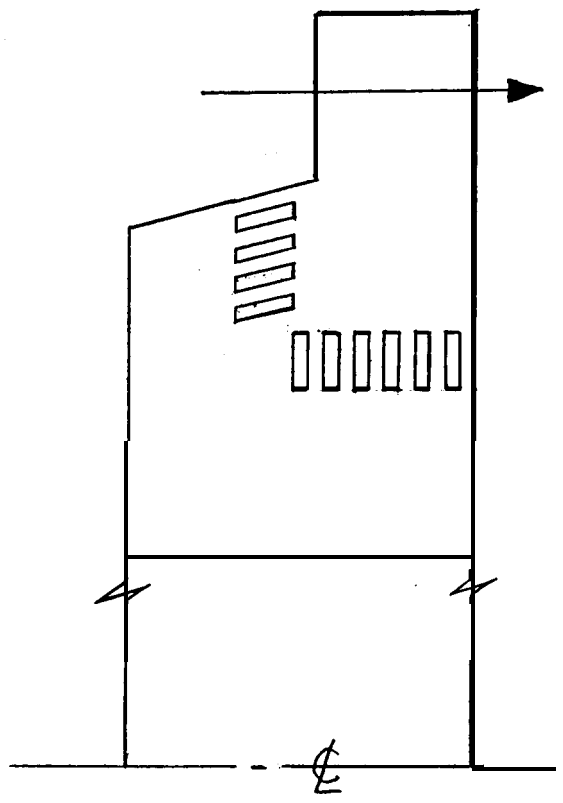
* Subcooled boiling is predicted

* Two-phase flow instabilities not likely

* DNBR not very large.

NLC TARGET COOLANT CHANNELS MAY BE RECTANGULAR SHAPED

* The sketch shows a possible arrangement of coolant channels. Instead of two round channels, numerous rectangular channels spaced closer and more evenly around the heat source are being considered.



NLC POSITRON TARGET THERMAL ANALYSIS

* The target will be cooled by conduction heat transfer to water cooling channels.

- hand calculations will be made to estimate temperatures in the target

- three-dimensional finite element computational models will be made to more accurately determine expected temperatures in the target

THERMAL STRESS ANALYSIS FOR POSITRON TARGET

* The thermal stresses expected in the part will be modeled using a coupled conduction heat transfer and structural analysis code.

- The time dependent and spacially dependent aspects of the beam energy deposition in the target will be modeled.

- A three dimensional simulation will be attempted

- Heat transfer to the coolant channels will be modeled using Nusselt number correlations for convective heat transfer in rectangular channels

THERMAL SHOCK STRUCTURAL ANALYSIS OF TARGET

* The rapid deposition of heat in the target will result in pressure waves in the target material.

* A hydro-code (LS-DYNA) will be used to model the rapid heat deposition from the beam and the resultant pressure waves and material stress