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Numerical simulation of heat transfer provided by an impinging droplet train[1] STEVEN R. LEWIS, MARIO F. TRUJILLO, University of Wisconsin, Madison — A detailed investigation of the parameters that affect cooling within the thermal boundary layer created by a stream of impinging HFE-7100 droplets striking a pre-wetted and heated surface is performed. After the initial transient has ended, the flow enters a quasi-steady state in which the liquid crown formed during continuous droplet impact remains nearly stationary. Factors including initial film thickness, surface tension, droplet velocity, volumetric flow-rate and droplet frequency are categorized as either contributing to changing the thickness of the thermal boundary layer or as non-contributing parameters. Additionally, an analytical solution for the growth of the thermal boundary layer is proposed, using a crown propagation model, to describe the flow within the boundary layer. The analytical model shows good agreement with numerical results and incorporates the influence of the previously identified parameters.

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