Thermal Management of Laser Projection Systems for Indoor and Outdoor Use

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Abstract. The paper discusses the design, implementation and evaluation of a new thermal management solution for laser projection systems used in both indoor and outdoor conditions. The requirements for such a solution include energy efficiency, reasonable production cost, small dimensions, capability of dealing with negative ambient temperatures and high humidity, and connectivity to a computer to track and optimize the control of the laser diode target temperatures and the humidity within the laser projection system. Our preliminary survey did not find suitable solutions on the market that we could obtain and that incorporate the above features. As a result, we created a new solution and tested some innovative ideas in the process such as the use of voltage-based control of the cooling element and the interplay of four separate algorithms for thermal and humidity management. The experimental results show a stable performance with enough headroom to cool down reliably more powerful laser diodes than we currently need.