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Heat dissipation Improvement of ATLAS (Detector) Electronics by Thermal Interface Materials based on Carbon Nanomaterials

Over the past decades, carbon nanomaterials were widely used in the main stream applications due to their expectional electrical, mechanical and magnetic properties. In addition to the mentioned properties, carbon nanomaterials are characterised by high thermal conductivity, with values as high as 6000 W/mK. In this presentation, we report on the incorporation of carbon nanomaterials in a commercial thermal interface material, in order to enhance the thermal transfer. The new developped thermal interface material based on carbon nanomaterials is intended to improve the heat dissipation in electronic parts of the ATLAS detector at CERN. The mixture of epoxy/carbon nanomaterials was achieved by following a precised protocol based on sonication. The thermal transmission measurements of the developed thermal interface materials were carried by an appartus built in house. Based on the recorded results, the highest heat dissipation is achieved by thermal interface materials fabricated with 1% of carbon nanomaterials. These results were supported by measuring the thermal resistance of these fabricated thermal interface materials by the ASTM D5470 approach and it revealed a decrease of 50%. Also, The thermal interface material showing the highest thermal transfer was tested on the low voltage power supply which was running on a test bench developed by the Wits team.

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