MATTER AND TECHNOLOGIES

Contribution ID: **16** Type: **not specified**

Sensor cracking studies with ATLAS ITk strips detector modules

Wednesday 18 September 2024 17:15 (3 minutes)

During pre-production of the ITk strips tracking detector for the upcoming ATLAS upgrade a certain number of modules have been found to have sensor cracks after thermal cycling when being loaded on the final support structures.
A number of materials and different types of adhesive used in the complete assembly create localized stress points when cooled. This leads to cracks in the silicon at temperatures close to the final operating conditions. Affected modules suffer from early sensors breakdown and broken strips.
In order to mitigate the potential loss of entire modules during detector operation, alternative methods of module assembly and loading onto the substructure have been investigated. Either a stiff Hysol adhesive bonding the silicon to the rigid support structure should reduce sensor flex. Alternatively, a thin capton layer between the sensor and the attached circuit boards should absorb some of the stress and form so-called interposer modules.
This poster presents the studies that have been carried out on pre-production petals to investigate the conditions under which cracks occur and their failure modes. In particular, a comparison is made between the proposed solutions.

Speed talk:

Normal speed talk selection

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Session Classification: Poster