



Contribution ID: 11

Type: not specified

Strength Measurement of Tracker Detector Composite and Titanium Structures

Wednesday 8 June 2022 16:55 (30 minutes)

Tracker detector structures are designed to hold detector's sensors and its services on its place and to minimize the sensors' displacements during operation. As part of the ATLAS Hi-Luminosity LHC Upgrade, LBNL has recently developed the global support structures for the ITk detector. These structures are mostly made out of carbon fiber, chosen for lightness, strength, stiffness and radiation length. Two critical subassemblies were identified: the bracket & flange ring and mount pad assemblies. To validate and verify their design and strength two simplified experimental representations were designed and tested. Deformations and strains were measured with LVDTs and strain gauges respectively. Here we discuss the different designs of these structures and their computed and measured performances. We also identify potential approaches to integrate a Structural Health Monitoring system on the detector.

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