

Study of adhesives for using in the construction of particle detectors

Research Area: particle detectors

Abstract/Brief Description: Determine the work module in Ansys that allows simulation of the behavior of adhesives typically used in fixing components within the housing of a particle collision detector, such as the Internal Tracking System for MPD.

Tasks:

Research in the state of the art on damages or service life of the adhesive under normal and high energy conditions.

3D model to perform the finite element analysis of the mechanical behavior of adhesives under different working conditions.

Report of the analysis by the finite element method.

Preliminary schedule by topics/tasks:

Week 1 - 2 Introduction to high energy detectors, training on detector components.

Week 3 - 4 Investigation on the conditions for simulating the mechanical characteristics of the adhesive, 3D model of an adhesive system.

Week 5-6 meshing and simulation of the adhesive system.

Week 7-8 Analysis and report of results.

Required skills: SolidWorks, Siemens NX, Ansys or Fusion 360, Thermal system, Mechanical Design, English or Spanish language for communication.

Acquired skills and experience: The student will become familiar with the design of high-energy detectors, will have a broader vision about the work and opportunity areas of mechanical engineers in projects related to applied physics.

You will learn how to perform analysis with real data and validate experimental results with simulations.

Recommended literature: Golovatyuk, V., Kekelidze, V., Kolesnikov, V. *et al.* The Multi-Purpose Detector (MPD) of the collider experiment. *Eur. Phys. J. A* **52**, 212 (2016). <https://doi.org/10.1140/epja/i2016-16212-1>

Murin, Y.A., Ceballos, C. & for the MPD-ITS Collaboration. The Inner Tracking System for the MPD Setup of the NICA Collider. *Phys. Part. Nuclei* **52**, 742–751 (2021). <https://doi.org/10.1134/S1063779621040444>

Introduction to Modeling Structural Adhesives, 3M Industrial Adhesives and Tapes Division, Technical report.

Magd Abdel Wahab, Ph.D., THE MECHANICS OF ADHESIVES IN COMPOSITE AND METAL JOINTS, Finite Element Analysis with ANSYS, DEStech Publications, Inc., ISBN No. 978- 6059-096-9,