Università degli Studi di Napoli Federico II

Scuola Politecnica delle Scienze di base

Corso di Studi in Ingegneria Meccanica

Corso di Laurea Specialistica in Ingegneria Meccanica per l'Energia e l'Ambiente
(Classe delle lauree in Ingegneria Meccanica N° 36/S)

Tesi di Laurea

Thermo-mechanical analysis of new materials (for the TED and TCDI) interacting with high energy particles beam

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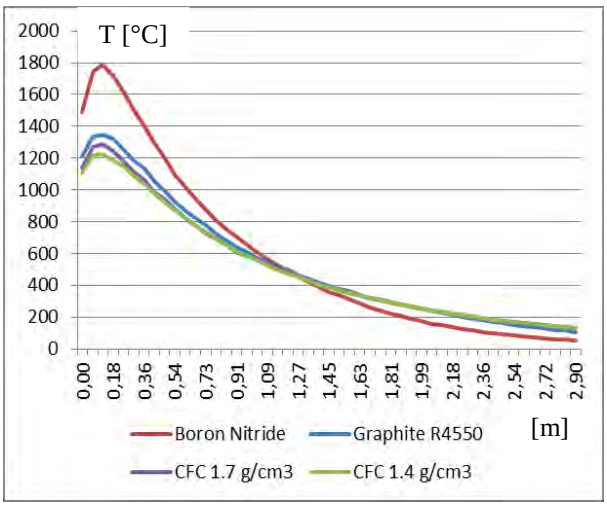
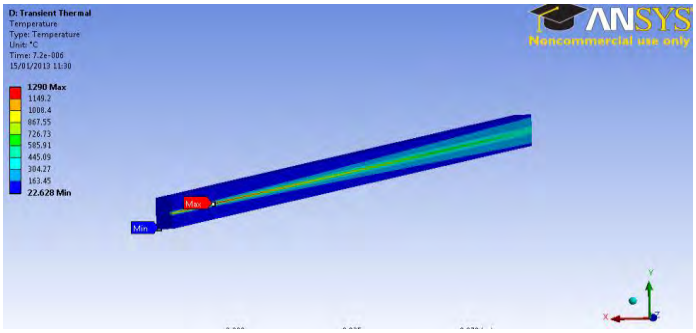
SOMMARIO DELLA TESI

In the frame of the injector upgrade for the LHC (Large Hadron Collider at CERN), all the devices downstream will have to handle more intense particle beams and consequently more stringent working conditions.
This dissertation deals with a thermo-structural analysis of two devices present on the transfer line SPS-LHC: TCDI (Target Collimator Dump Injection) and TED (Target External Dump). These devices are essential for cleaning and aborting the beam particles.
High energy particles, interacting with nuclei of materials, lose their energy that is deposited on the hit structure. The evaluation of thermal loads is usually performed via statistical codes based on Monte-Carlo method (FLUKA).
Energy deposition maps obtained from this type of simulation are used as input for thermo-structural studies. The gradients of temperature (consequently to the high energy particles beam hitting the structure) will be responsible of stresses generated within the material.
Thermo-structural effects provoked by particle beam impacts have been studied via a FEM tool ANSYS®.
The analysis were done on several kind of material: Graphite R4550(actual configuration), Boron Nitride, 2D composite materials with short carbon fiber in a graphite matrix (CFC 1.4 g/cm3 and 1.7 g/cm3).





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