


UNIVERSIDADE DE SÃO PAULO - USP




Challenges to simulate and test BSM models.

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Physics (SM) is a set of theories that describes the structure of matter and has good agreement with experimental results. Although its success, the SM has a complete description of nature. For instance, it does not describe gravity, dark matter, or dark energy. So, studying models Beyond the Standard Model (BSM), and their consequences, is an important approach in the field of particle physics.

Theories, one approach involves simulating BSM events. To accomplish this, software packages like MadGraph and Pythia, allowing the simulation of the BSM process can be generated, analyzed, and then compared with experimental data.



calculate and generate Feynman diagrams and matrix elements for a wide range of processes involving the interactions of elementary particles. It can generate processes, to tree-level calculations, and generate events. Pythia is a Monte Carlo event generator, it is commonly used to simulate the outcome of collisions.

An important computational approach to studying such models and to solve the

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Development of an optical biosensor based on surface plasmon resonance phenomenon for fast diagnosis

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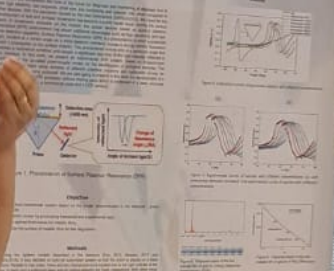
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**Background**

Surface plasmon resonance (SPR) is a phenomenon that occurs at the interface between a metal and a dielectric medium. It is characterized by the excitation of surface plasmons, which are collective oscillations of the free electrons in the metal. This phenomenon is highly sensitive to changes in the refractive index of the medium adjacent to the metal surface, making it an ideal platform for the development of biosensors.

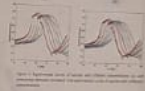
**Methods**

The SPR biosensor was developed using a gold-coated glass substrate. The refractive index of the medium adjacent to the metal surface was varied by the presence of a biological sample. The SPR angle was measured using a laser source and a photodetector. The results were compared with theoretical calculations and experimental data.



**Results**

The SPR angle was measured for different concentrations of the biological sample. The results show a linear relationship between the SPR angle and the concentration of the sample, indicating the sensitivity of the biosensor. The detection limit of the biosensor was determined to be 10<sup>-6</sup> M.



**Conclusions**

The SPR biosensor developed in this work is a simple and sensitive platform for the detection of biological samples. The results show that the SPR angle is highly sensitive to changes in the refractive index of the medium adjacent to the metal surface, making it an ideal platform for the development of biosensors.

**Acknowledgments**

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USP

Analysis of Thermal Stresses Produced on TCAR Thermal Vascular Vessel due to Baking Process

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**Background**

Thermal stresses are produced in TCAR thermal vascular vessels during the baking process. The analysis of these stresses is essential for the design and optimization of the vessels. This work aims to analyze the thermal stresses produced on TCAR thermal vascular vessels during the baking process.



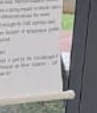
**Methods**

The thermal stresses were analyzed using finite element analysis (FEA). The vessels were modeled using a 3D mesh, and the thermal stresses were calculated using a finite element method. The results were compared with experimental data.



**Results**

The results show that the thermal stresses are highest in the regions of the vessel where the temperature is highest. The maximum stress is observed in the region of the vessel where the temperature is highest, and it decreases as the temperature decreases.



**Conclusions**

The analysis of thermal stresses produced on TCAR thermal vascular vessels during the baking process is essential for the design and optimization of the vessels. The results show that the thermal stresses are highest in the regions of the vessel where the temperature is highest, and it decreases as the temperature decreases.

**Acknowledgments**

This work was supported by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and the Financiadora de Estudos e Projetos (FINEP).