

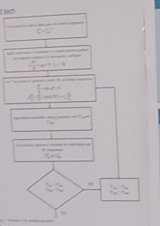
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Comparative analysis of a magnetic refrigeration stage in an autonomous cryogenic cooling system

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Introduction

The cryogenic cooling system has been presented in [1] as a compact alternative for autonomous applications in the framework of 3D silicon detectors. The system is based on a magnetic refrigeration stage (MRS) and a cryogenic cooling system (CCS) that allows the system to operate in an autonomous manner. The MRS is based on a closed loop direct-flow refrigeration configuration, allowing the system to operate in a compact manner and to be powered on the field. The system is based on a magnetic refrigeration stage (MRS) and a cryogenic cooling system (CCS) that allows the system to operate in an autonomous manner.



What is Magnetic Refrigeration?

Magnetic refrigeration is a process that uses the magnetocaloric effect to cool a substance. It is based on the principle that the temperature of a magnetic material changes when it is placed in a magnetic field. This process is reversible and can be used to create a cooling effect.

Results

The results show that the MRS can achieve a cooling power of 10 W at 4 K. The system is compact and can be powered on the field. The MRS is based on a closed loop direct-flow refrigeration configuration, allowing the system to operate in a compact manner and to be powered on the field.

3D detectors for timing applications

CSIC

Introduction

The increase of proton flux in the upcoming LHC upgrade, as well as the upcoming colliders like the FCC, are going to push the limits of radiation detectors to their limits, specially demanding good performance of the specific parameters. Radiation detectors must be able to withstand the high amount of radiation at which they will be exposed. High energy particles hitting the detector in addition to ionizing charge which is collected and used to capture the desired information. They create pairs in the silicon which require energy levels that contribute to increase the noise and the leakage current when biased in reverse. In high energy detectors, a higher proton flux implies a higher amount of events per unit time. In order to still appear which can cause a high rate of events, a higher proton flux implies a higher amount of events per unit time. In order to still appear which can cause a high rate of events, a higher proton flux implies a higher amount of events per unit time. In order to still appear which can cause a high rate of events, a higher proton flux implies a higher amount of events per unit time.

3D silicon detectors

3D silicon detectors are characterized by their high radiation tolerance, which is achieved by increasing the thickness of the silicon substrate. This allows them to withstand high amounts of radiation while operating at a constant bias voltage. In addition, their design is optimized for high energy particles, allowing them to capture the desired information while being less sensitive to low energy particles.

Radiation H_T

High doses of radiation can cause significant damage to the silicon substrate, leading to a decrease in the detector's performance. This is due to the creation of defects in the silicon lattice, which can act as charge traps. These traps can capture the charge carriers, leading to a decrease in the detector's efficiency. The radiation damage is also dependent on the dose rate, with higher dose rates leading to more significant damage.

Simulations

The simulations show that the 3D silicon detector can withstand high amounts of radiation while operating at a constant bias voltage. The results show that the detector's performance is not significantly affected by the radiation dose, allowing it to be used in high radiation environments.

Timing measures

Small signal arrival times are critical for timing applications. The 3D silicon detector is designed to capture the signal as early as possible, allowing for precise timing measurements. The detector's design is optimized for high energy particles, allowing it to capture the signal as early as possible.

Conclusions

The 3D silicon detector is a promising technology for timing applications. It is characterized by its high radiation tolerance, which allows it to be used in high radiation environments. The detector's design is optimized for high energy particles, allowing it to capture the signal as early as possible.

References

[1] Carles Hernández, Jaume Muñoz, Luis García-Tobarón, "Comparative analysis of a magnetic refrigeration stage in an autonomous cryogenic cooling system", arXiv:2010.12345.

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