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ACOUSTIC EFFECTS FROM COSMIC RAY SHOWERS IN GRAVITATIONAL WAVE RESONANT ANTENNAS

Abstract content

Passage of cosmic rays in a resonant antenna generates mechanical vibrations, originated by the local thermal expansion caused by the warming up due to the energy lost by the particles crossing the material. The thermo-acoustic model accounts for the amplitude of these vibrations, but recent measurements of the high energy cosmic ray coincidences in the gravitational wave detector Nautilus showed a higher rate with respect to the model when the antenna was in superconducting state. The RAP experiment has been proposed to study the response of resonant bars to the crossing of high energy particle showers, both in normal conducting and in superconducting state of the detector material. Two cylindrical bars, made by Al5056 aluminum alloy and niobium, have been exposed to the 510 MeV electron beam coming from the DAFNE accelerator Linac. The amplitude of the first longitudinal mode of oscillation of the bars has been measured and compared with the expectations from the thermo-acoustic model. A good agreement, at the 10% level, has been found in both the bars between data and model, at all temperatures in normal conducting state. Measurements with the niobium bar showed discontinuity in the signal response at the transition temperature and a (temperature dependent) disagreement with the model, in superconducting state.

If this papers is presented for a collaboration, please specify the collaboration

RAP collaboration

Summary

Reference

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