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Optical Charging Issues at LIGO

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Abstract content

The Laser Interferometer Gravitational-Wave Observatory (LIGO) consists of Fabry-Perot Michelson interferometers designed to measure gravitational waves at frequencies between 10 Hz and 3 kHz. One potential noise source in this frequency range is the buildup and motion of surface charge on the optics, which can be generated through friction with air, contact with other materials, or interaction with the showers of charged particles generated by cosmic rays. Charge contributes noise by generating fluctuating electric fields, interfering with optical position control, and reducing reflectance by attracting dust to the optical surface. The magnitude of the noise contribution depends both on the amount of charge and the relaxation time associated with its motion; charge densities greater than $10^5 e/cm^2$ and relaxation times smaller than 4×10^7 seconds would result in significant noise in the sensitive frequency band. In this talk we will discuss measurements of charge buildup and relaxation times, as well as possible charge mitigation techniques.

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

LIGO

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 3 (OG part 2), pages 1283-1286

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