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Thu-Mo-Po4.14-07 [114]: Research of Position Detection and Magnetic Feedback on a Superconducting Levitation Sphere for Gravity Measurement

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A device for superconducting gravity measurement with high observing precision and stability is developed. In this device the test mass and spring are in the form of a superconducting sphere and superconducting magnet which is operated in the persistent mode. Once the sphere is levitated in the field generated by the superconducting magnet and the gradient adjusted, the sphere will move relative to the coils of the magnet in response to local gravity changes. In this paper a method of differential capacitance is presented to detect the position of the sphere. The levitation system is operated in magnetic feedback through the feedback coil so that the sphere remains in a position that nulls the capacitance bridge. The magnetic feedback is highly linear and automatically nulled when the capacity bridge output is zero. The position detection and feedback system must be stable, sensitive and linear and the capacitance accuracy has reached the level of $\Delta C/C=10^{-5}$.

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