Physics > Instrumentation and Detectors

Wide-band current preamplifier for conductance measurements with large input capacitance

Andrey V. Kretinin, Yunchul Chung

(Submitted on 10 Apr 2012)

A wide-band current preamplifier based on a composite operational amplifier is proposed. It has been shown that the bandwidth of the preamplifier can be significantly increased by enhancing the effective open-loop gain of the composite preamplifier. The described preamplifier with current gain 10^7 V/A showed the bandwidth of about 100 kHz with 1 nF input shunt capacitance. The current noise of the amplifier was measured to be about 46 fA/$\sqrt{\rm Hz}$ at 1 kHz, close to the design noise minimum. The voltage noise was found to be about 2.9 nV/$\sqrt{\rm Hz}$ at 1 kHz, which is in a good agreement with the value expected for the operational amplifier used in the input stage. By analysing the total noise produced by the preamplifier we found the optimal frequency range suitable for the fast lock-in measurements to be from 1 kHz to 2 kHz. To get the same signal-to-noise ratio, the reported preamplifier requires roughly 10% of the integration time used in measurements made with a conventional preamplifier.

Comments: 5 pages, 4 figures
Subjects: **Instrumentation and Detectors (physics.ins-det)**; Mesoscale and Nanoscale Physics (cond-mat.mes-hall)
Cite as: **arXiv:1204.2239v1 [physics.ins-det]**

Submission history

From: Andrey Kretinin Dr. [view email]
[v1] Tue, 10 Apr 2012 18:29:52 GMT (167kb)

Which authors of this paper are endorsers?