

TECHNIQUES FOR THE MEASUREMENT OF ELECTRICAL
PROPERTIES OF CORES IN THE FREQUENCY RANGE 10 Hz TO 10 MHz

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ABSTRACT

Two and four-electrode techniques have been used to measure the complex impedance of 14 tight gas sand samples, Berea sandstone, and Ottawa sand-bentonite packs in the frequency range of 10 Hz to 10 MHz.

A four-electrode circuit is designed for complex impedance measurement of rocks as well as of sand packs from 10 Hz to 1 MHz. It operates in conjunction with a high pressure resistivity cell that allows measurements while fluid is flowing through the sample. This four-electrode setup offers a number of advantages over the simple two-electrode setup. The latter requires measurements on the sample at two or more different sample thicknesses to be able to quantify the contact impedance at the sample/electrode interface. This is a tedious and time consuming process. The four-electrode setup, however, eliminates the contact impedances at the current electrodes in addition to providing measurements at overburden stress. Perhaps the biggest advantage is the ability to make measurements on partially saturated samples desaturated uniformly by a displacement process. For situations where two-electrode measurements needed to be made, electric field fringing at the disc edges and contact impedances have been quantified and eliminated from the measured signals.