

## Calibration of Parasitic Capacitance and System Response in Broadband Complex Resistivity Measurement Systems

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### SUMMARY

Laboratory specimen testing plays a crucial role in elucidating the relationship between physical parameters of rocks and geophysical field data, forming the foundation for constructing geological and geophysical models. Complex resistivity measurement (Spectral induced polarization) stands out as a potent method for probing the internal structure, mineral composition, and fluid chemical properties within porous rocks. However, this technique encounters challenges, particularly at higher frequencies, due to the influence of parasitic capacitance, contact impedance, and electrode polarization on measurement outcomes. To accurately characterize the induced polarization effects, we developed a broadband complex resistivity measurement system for rocks and ores, incorporating a specialized analyzer and sample holder, and employing the four-electrode method for precise measurement.

Our investigation focused on the impact of parasitic capacitance in acquisition channels and system response under high-frequency conditions on measurement accuracy. We identified error sources associated with different circuit designs and proposed a methodology for quantifying instrument's parasitic capacitance and conducting the calibration of the instrument. By evaluating electrical circuits, we confirmed that measurement errors of post-calibration impedance remain below 1%. Comparison with data from the Solartron 1260A instrument validated the consistency of our measurements. Furthermore, we examined how contact impedance of the measurement device influences test results and utilized an advanced sample holder to characterize induced polarization in lead-zinc ore and limestone samples. Employing the Cole-Cole model for inversion, we achieved satisfactory fitting of experimental data.

**Keywords:** Complex resistivity, parasitic capacitance, contact impedance

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