

## **Influence Factors of Measured Signal Intensity and the Response Characteristics of the Toroidal Coil Excitation LWD Laterolog Instrument**

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### **ABSTRACT**

Compared with the traditional electrode resistivity LWD instrument, the toroidal coil excitation LWD laterolog instrument has significant advantages of wear resistance and less process difficulty. However, there is little theoretical research on this instrument in China. Based on the 3D finite element method, the logging response characteristics of the toroidal coil excitation LWD laterolog tool were studied, which analyzed the influence of instrument structural parameters on measured signal intensity. The simulation results indicated that measured signal intensity was positively correlated with the distance of receiving coils, and the longer the source spacing of the instrument and the bit sub, the weaker the measured signal intensity. Based on the simulation results, the simulation parameters were optimized. Researchers studied the detection characteristics of the instrument under different formation resistivity contrast, as well as the logging response characteristics of the instrument in deviated wells with different inclinations and surrounding rocks. Compared with the cable laterolog tool, the toroidal coil excitation LWD laterolog tool has a shallower detection depth, but it can meet the requirements of LWD. The research results are significant and can be used to guide the structural parameter design and the research on logging interpretation methods of toroidal coil excitation LWD laterolog instrument.