



Improved Data Preprocessing Algorithm for Time-Domain Induced Polarization Method with Digital Notch Filter

Shuang-Chao GE^{1,2}, Ming DENG², Kai CHEN², Bin LI³, and Yuan LI²

¹North University of China, Taiyuan, Shanxi, China; e-mail: GeShCh@nuc.edu.cn

²Key Laboratory of Geo-detection Ministry of Education,
China University of Geosciences, Beijing, China;
e-mail: dengming@cugb.edu.cn (corresponding author)

³Technical Department TSLC, Taiyuan, Shanxi, China; e-mail: msepaper@163.com

Abstract

Time-domain induced polarization (TDIP) measurement is seriously affected by power line interference and other field noise. Moreover, existing TDIP instruments generally output only the apparent chargeability, without providing complete secondary field information. To increase the robustness of TDIP method against interference and obtain more detailed secondary field information, an improved data-processing algorithm is proposed here. This method includes an efficient digital notch filter which can effectively eliminate all the main components of the power line interference. Hardware model of this filter was constructed and Vhsic Hardware Description Language code for it was generated using Digital Signal Processor Builder. In addition, a time-location method was proposed to extract secondary field information in case of unexpected data loss or failure of the synchronous technologies. Finally, the validity and accuracy of the method and the notch filter were verified by using the Cole-Cole model implemented by

SIMULINK software. Moreover, indoor and field tests confirmed the application effect of the algorithm in the fieldwork.

Key words: power line interference, digital notch filter, decay curve, apparent chargeability, SIMULINK.