

Development of High Speed GPR for Railtrack Assessment

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Rapid and non-destructive evaluation of the quality of the railway infrastructure, specifically the under-track ballast, is a growing concern worldwide, and GPR has demonstrated its ability to provide such an evaluation, within the constraints of the available technology. This paper presents the results of ongoing research into the development of a high-speed train-mounted multiple-antenna GPR system for non-destructive assessment of the railway trackbed. By travelling on trains in service and at line speeds, such an inspection system can significantly improve the efficiency and cost-effectiveness of maintaining and renewing railway under-track ballast. The paper addresses the issues of antenna shielding against electromagnetic interference, electromagnetic compatibility tests, antenna choice, configurations and positioning, as well as optimal methods for triggering, registration, and post-processing.

Methods for triggering an array of GPR antennas and transferring control between multiple systems are investigated and detailed, as are techniques for coordinating different data sets, namely, multi-frequency GPR arrays, multiple video sequences, GPS positioning data, GIS location data and other track data, in order to fuse the data layers both before and after interpretation within the existing rail model. The paper further details the design and implementation of the control units, the GPR event marker system and data fusion layers prior to processing and interpretation. Results are presented from the UK's first high-speed (60 mph) train-mounted GPR trials.