

Data analysis of road pavement density measurements using ground penetrating radar (GPR)

ABSTRACT

This work describes an analysis of Ground Penetrating Radar (GPR) measurements at frequency range of 1.7-2.6 GHz to get a relationship between attenuation and density for nine road pavements slabs with different densities. There are about two different frequencies had been tried. The method is simple, fast, contact less and accurate way to determine the density of road pavement. The most important parameter that used in this project is density where it can be used to determine the compressive strength of road pavement. In laboratory, the measurement system consists of a signal generator (250 kHz-3GHz) as a source, spectrum analyzer (100Hz-8GHz), directional coupler with adapter and horn antenna. The first part of the measurement system setup is to determine the amplitude of transmitted wave (received signal strength). A few of received signal strength and attenuation for nine pavement slab samples were taken at two different frequencies. The GPR mixture model has been used to produce the simulation data and has been compared with measurement data. An instantaneous method for measuring the density of road pavement in wave propagation was developed by using microwave transmission/ reflection technique and free space method at two frequencies. The MATLAB software is used to analyze the measurement and simulation data and also for the graphs comparisons. The relative error between measurement and simulation were calculated. The results from the GPR measurement were used and were elaborated in data statistical analysis.

Keyword: Road pavement; Density; Ground penetrating radar