Application of GPR in assessing of concrete dam structures health

Aleksandar Ristić¹, Željko Bugarinović¹, Milan Vrtunski¹, Miro Govedarica¹, and Lara Pajewski²

¹University of Novi Sad, Faculty of technical sciences, Department of computing and control, Novi Sad, Serbia
(aristic@uns.ac.rs)
²Department of Information Engineering, Electronics and Telecommunications, Sapienza University of Rome, Rome, Italy

In this paper an application of GPR in the analysis of concrete structure is presented. Scanning is done as a part of preparation for mitigation works of dam ‘Grančarevo’. The goal was to inspect existing small cracks and leakages. The dam is arc-shaped concrete dam with double curvatures. It is operational since 1968, and is situated 18km downstream from the wellspring of Trebišnjica river and 17km upstream from the town Trebinje, in Bosnia and Herzegovina. Relative height of the dam is 123m, while its width along the crown is 439m. Continuous monitoring of dam's construction and surrounding terrain is conducted at over 800 measuring points. In order to determine precise position, geometry and propagation of cracks, this was the first time GPR was used.

GPR scanning was done on several important locations: on the crown, downstream face, internal galleries, down- and upstream walls, using antennas with 900 and 400MHz central frequencies. Based on scanning results, position and geometry of cracks within the concrete are successfully determined. Lateral scanning (on downstream face of the dam) are correlated with the results obtained on the crown. Also, at several locations, zones with higher humidity are noticed. These zones are significant since they present areas of higher priority during mitigation and they are often found in the vicinity of junctions between two concrete segments of the dam.

Obtained results indicate that GPR technology is rather useful tool for structure health monitoring which provides information that are significant in planning mitigation measures and extending a lifetime of a concrete object.