Contribution ID: **168** Type: **talk**

Development of muon scattering tomography for a detection of reinforcement in concrete

Tuesday, September 14, 2021 2:40 PM (15 minutes)

Inspection of ageing, reinforced concrete structures is a world-wide challenge. Existing evaluation techniques in civil and structural engineering have limited penetration depth and don't allow to precisely ascertain the configuration of reinforcement within large concrete objects. The big challenge for critical infrastructure (bridges, dams, dry docks, nuclear bioshields etc.) is understanding the internal condition of the concrete and steel, not just the location of the reinforcement.
Muon scattering tomography is a non-destructive and non-invasive technique which shows great promise for high-depth 3D concrete imaging.
A method was presented to locate reinforcement placed in a large-scale concrete object. The reinforcement was simulated as two layers of 2 m long bars, forming a grid, placed at a fixed distance from each other inside a large concrete block. The technique exploits the periodicity of the bars in a reinforcement grid by considering the Fourier-transformed signal. The presence of a grid leads to peaks in the normalized Fourier frequency spectrum. Peaks locations are determined by the grid spacing and their amplitude by the bar diameters. It is therefore possible to estimate both bar diameter and spacing with this method.
Using only one week worth of data taking, bars with a diameter of 7 mm and larger, could easily be detected for a 10 cm spacing. The signal for 6 mm diameter bar exceeds the background and but becomes very clear after two weeks of data taking. Increasing the spacing to 20 cm results in a smaller amount of iron in the scanning area, thus longer data taking is required. It has been shown that this method enables the detection of the smallest bars in practical use within one or two weeks of data taking time and standard spacing. This is a very important result for non-destructive evaluation of civil structures.

Title

ms

Your name

Magdalena Dobrowolska

Institute

University of Bristol

email

m.dobrowolska@bristol.ac.uk

Nationality

Polish

Primary authors: Dr KOPP, Anna (University of Bristol); DE SIO, Chiara (University of Bristol); VELTHUIS,

Jaap; DOBROWOLSKA, Magdalena (University of Bristol); PEARSON, Philip (Cavendish Nuclear); MILNE, Ruaridh (Cavendish Nuclear)

Presenter: DOBROWOLSKA, Magdalena (University of Bristol)

Session Classification: Applications in Nuclear Physics and Nuclear Industry; X-ray and Gamma Ray Detectors 1; Medical Applications of Position Sensitive Detectors 2

Track Classification: Applications in Nuclear Physics and Nuclear Industry