1.3.6. ULTRASONIC TOMOGRAPHY OF METALS USING THE SAMPLING FOCUS METHOD

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Ultrasonic phased array flaw detectors (tomographs) provide principally new quality level in metals inspection. Most of them are using the method of electronic angle or input point steering of ultrasonic beam of antenna array resulting with imaging of object's cross section [1].

Another method of ultrasonic tomography is based on the scattered sending and weakly-directional reception of echo-signals followed by computer processing with focusing of array's elements in each point of visualized section. In other words this is a sampling focus array method (SFA). The method provides higher sensitivity and better resolution of instrument comparing to physical forming and steering of ultrasonic beam. Originally the method was developed for concrete inspection tomography instrumentation [2, 3], but later adapted to the tomographic instruments for metals and welds inspection. Data collection is provided by signals acquisition from all possible combinations of sending-receiving elements of the array with further tomographic SAFT-C (combinational) processing algorithm [4].

The advanced algorithms of SFA tomography allows combining the images received from the direct ultrasonic beams and multiple reflected beams from the backwall and surface of testing objects. At that on the reconstructed image the 'point' and flat reflectors of different orientation are screened differently, depending on the accounted in the calculations paths of ultrasonic signals propagation in the testing object. In particular the cross cracks are well screened when using at reconstruction the ultrasonic signals reflected from the surface and backwall of testing object odd number of times. Using the signals from even times reflection improves imaging of horizontally directed cracks and delaminations. In addition this excludes the ghost imaginary areas on tomograms, located below the backwall.

The fig. 1 shows the example of tomogram received on rail head with cross crack almost vertical to the surface using SFA method and SAFT-C processing. The crack surface is fully screened and is possible to detect its length in depth.

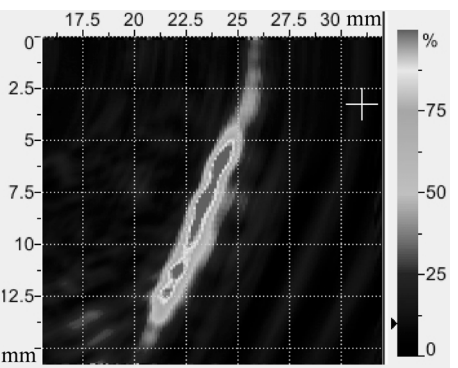

Fig. 1.

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