1.3.17. UT-INSPECTION OF THE CRDMH WITH AN OPTIMIZED PHASED ARRAY PROBE AND THE ADDITIONAL DETERMINATION OF LIGAMENTS WITH SAFT

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The resolution of the standard UT technique of the evaluation of reportable indications in the U-groove seam in the CRDMH (Control Rod Drive Mechanism Housing) was not sufficient. So, a new phased array probe was developed. Beside the now possible detection (with an extra sizing scan) of about 2 mm ligaments, the probe is also optimized to use it together with an optional SAFT module integrated in the standard UT-software of the SAPHIR^{plus} system, for even more accurate analysis.

In the past, several reportable indications were detected in two Germans plants. Two convel1tional UT-probes (OSEL4, 32SEL2) were used for detection and sizil1g. The task was to measure the size of the indications to clarify if there is ligament between the indications and with reactor water covered surface. With these probes no clear prediction was possible. So, in addition an analysis method (SAFT – "Synthetic Aperture Focusing Technique") was qualified, which led to a slightly improved accuracy and to a better prediction. As the used probes are focused ones, which' is not the optimal circumstance for using SAFT, the accuracy was Stilll10t satisfactory.

For further improvement a new phased array probe was developed together with the BAM ("Bundesanstalt für Materialforschung- und Prüfung"). With standard analysis (sizing scan) using the new probe (0EL4 (19×12) V16C) the accuracy could already be considerably enhanced and very small ligaments are detectable.

In fact, the il1tention of the new design, based on various simulations performed by BAM, was the use of this probe together with an improved SAFT–algorithm (developed by BAM). This algorithm enables e.g. the superposition of sound fields with different beam angles. The result is a "divergent" beam, that is required for optimal results using the SAFT–algorithm.

We have implemented this SAFT–algorithm into our SAPHIR^{plus} analysis software. The module caп be used as easy as any other of the analysis tools of SAPHIR^{plus}.

First results of the analysis of our CRDMH referel1ce block with the new SAFT module show that the dimensions of the reference flaws and also the size of ligaments can be measured more accurate than before.

To summarize, for future ISI in nuclear plants, we have a very accurate and fast analysis method for the inspectiol1 of the U-groove seam in the CRDMH available. We are able to determine the size of indications and, if present, the size of a ligament with a high precision.