

4.5.20. SIMULATION OF ULTRASONIC, EDDY CURRENT AND RADIOGRAPHIC TECHNIQUES WITH THE CIVA SOFTWARE PLATFORM

Dubois P., Lonné S., Mahaut S., CEA, LIST, Gif-sur-Yvette, France

The simulation of Non Destructive Testing (NDT) plays an increasing role as it provides an efficient way to conceive and to optimise NDT methods or probes, helps for data interpretation, supports inspection qualifications. This communication aims at presenting an overview of the current simulation capabilities of the CIVA software platform developed by CEA-LIST and partners. CIVA gathers UT, ECT and RT simulation modules. Those modules are mostly based on semi-analytical approaches in order to address fairly complex configurations while keeping reduced computation times. Hybrid methods locally coupling finite elements schemes and semi-analytical techniques may also be carried out in order to assess very complex cases. The different models and techniques shares common GUIs, visualization and CAD tools.

In UT, one can simulate the beam transmitted by the probes (conventional probes, dual probes, phased arrays...) and the echoes arising by defects in possibly complex parts components (described by CAD). The codes rely on integral methods and different approaches for flaw scattering (Kirchhoff, Geometrical Theory of Diffraction, Separation of Variables) depending on the nature of the flaw and of the technique (pulse echo, TOFD).

In the same way ECT simulation includes both primary field computation and calculation of response of flaws. Single or multiple bobbin coils (with/without ferrite cores) can be used in different operating modes (absolute, differential, Remote Field) over planar or cylindrical conductive or ferromagnetic components. The codes rely on the Volume Integral Method and the Green's dyad formalism.

RT simulation codes allow to simulate X-rays or γ -rays inspections of simple or complex 2D/3D CAD parts. The radiographic images are simulated in the presence of flaws of arbitrary shapes (parametric or 3D CAD flaws or inclusion), for the common radiographic films. Ray casting and Beer-Lambert model are used to simulate attenuation along the path of the photons while the scattered radiation is calculated by Monte-Carlo computational method with a possibility of combining these two methods in an optimal way.

After having briefly recalled these different models, emphasizing on recent developments and experimental validations, we present several applications which illustrate on practical cases the interest of the simulation.