



CIVA
N·D·E | 11

Simulation Software for Non-Destructive Testing

Application Example N°10

Improve the reliability of your diagnosis

Background

You must strive to **continuously improve** the reliability of your inspection diagnostics in order to avoid:

- Incidents that may affect safety and/or security.
- Incurring operating costs resulting from misdiagnosis.
- Significant investment in equipment repair or replacement resulting from inadequate inspection results.

CIVA simulation software allows you to find, even for complex cases, a solution that meets your technical and financial requirements.

Benefits

Using a systematic process based on CIVA **simulation results**, your in-service inspection diagnostics will be more reliable than for an ad hoc approach. You will then be able to:

- **Better manage the safety** and security risks in your plants, thereby reducing downtime costs.
- **Justify relaxing operational constraints**, thereby increasing productivity.
- Better control the process, thereby **reducing expenditures** to repair and maintain equipment.

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Improve the reliability of your diagnosis

Case study

Ease the interpretation of results for complex cases

THE PROBLEM

Interpretation of some inspection results can be difficult due to complexity introduced by:

- The geometry of the specimen.
- Defect morphology.
- Material properties.

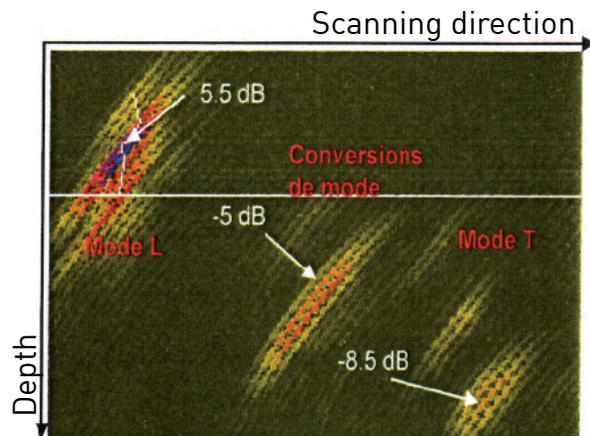
The example presented here illustrates how difficult interpretation of results can be when the underlying physical phenomena introduce complexity, in this case reflections after the backwall echo, mode conversion, diffraction, corner echoes, and beam splitting resulting from a non-planar crack.

Difficulties in interpretation can translate into diagnostic errors, which may have serious consequences.

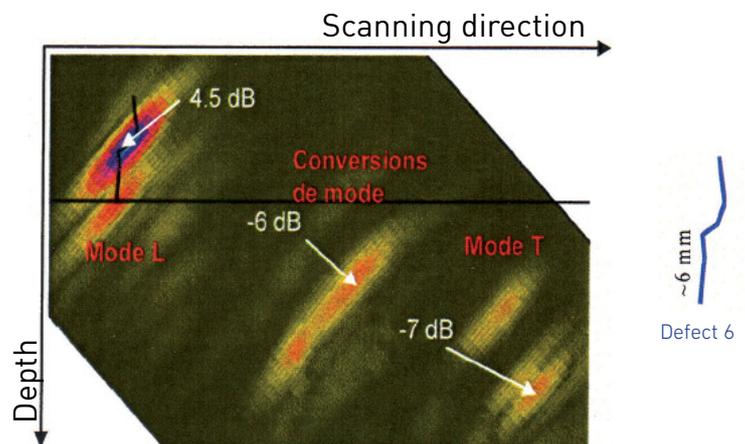
CIVA'S CONTRIBUTION

CIVA can help:

- **Understand** the underlying physical phenomena.
- **Ease interpretation** by allowing comparison of experimental results to simulated images.
- **Reduce uncertainty** and increase confidence in the diagnosis.
- Optimize and adapt your maintenance policy to **minimize downtime and cost**.



Experimental B-scan showing multiple echoes. The echo labels are an interpretation assuming the crack shape shown below.



CIVA simulated B-scan corresponding to the crack shape shown in the drawing. The simulated results show excellent correlation to the experimental results, verifying the postulated crack shape



This validation study was funded by IRSN (French Institute for Nuclear and Radiation Safety). IRSN contributes to the validation of simulation and to the development of models for ultrasonic, eddy-current and radiographic techniques. IRSN's primary NDT objective is to use validated simulation to satisfy their mission as a center of expertise.

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