CIVA N·D·E EDU²

CIVA Education: Exploring NDT Physics through Interactive Simulation

"CIVA Education", a streamlined version of the NDT simulation software **"CIVA"**, is the **ultimate tool to help you teach the "physics behind NDT"** to your students and trainees efficiently, interactively, and at a low cost.

Interpreting the raw results from NDT systems can be challenging to interpret due to the numerous input parameters and the complex physical phenomena involved in an inspection.

Additionally, the time available to train students and inspectors on the physics of NDT is often limited due to manufacturing demands or lack of various test pieces which cause the focus to be primarily on the practical skills such as manipulating the probe, setting the system, etc. This can cause a gap in the versatility of an inspector's working knowledge of the physics leading to further manufacturing delay caused by false alarms on new geometries or retraining for each specific manufactured component.

The **simple, realistic, and interactive interface of CIVA Education** addresses these challenges by highlighting the main phenomena and making **typical NDT results easier to understand.**

It **provides a wealth of comprehensive images and analysis curves,** which facilitates **a more efficient understanding** of results compared to individual signals.

With **quick computations**, users can easily **simulate various inspection configurations** and understand the importance and impact of the main input parameters including component geometry and dimensions, material properties, probe/source types and settings, and defect locations and dimensions just to name a few.

Discover this versatile tool for UT, ET, RT and GWT, designed for universities and training centers from the leading NDT simulation software trusted globally across various industries!

Learn more about CIVA Education here:

http://www.extende.com/physics-of-ndt-made-clear-by-simulation

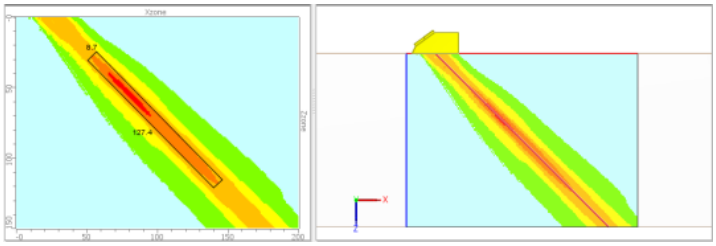
UT Module:

In this module, two types of computations are available: Beam computation and Inspection simulation. Planar, cylindrical and V-weld geometries can be selected for the component. Conventional, Phased Array, and TOFD probes can be simulated.

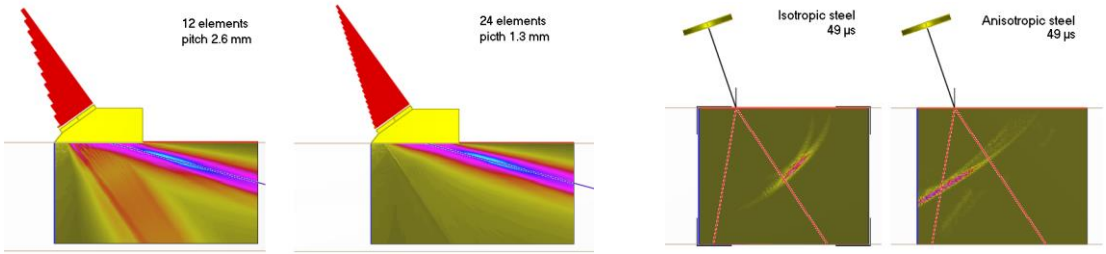
Example of simulations:

In UT, **the beam module** of CIVA education can effectively illustrate various phenomena, including:

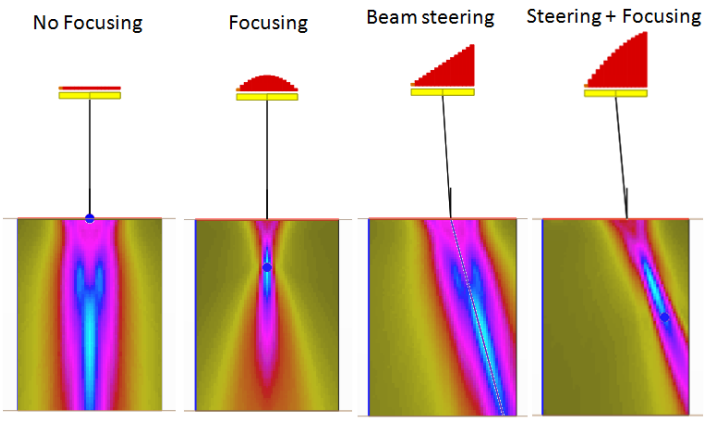
- Visualize and characterize **the different parts of the beam** for a given probe including the near field, far field, location of the maximum, focal spot size and beam coverage



- Visualize the **beam propagation**, especially during specific phenomena in anisotropic materials and grating lobes with a Phased-Array Probe.



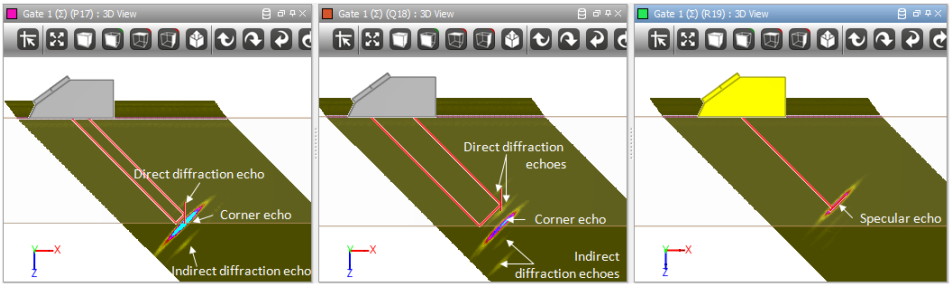
- Understand and see the effects of **focusing and beam steering**.



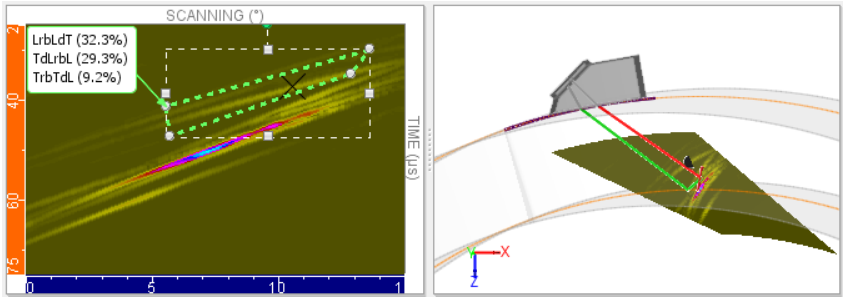
- Visualize the **impact of physical parameters** such as probe frequency, material velocity, and geometry on the emitted beam.
- Evaluate the **sensitivity zone of a separate T/R probe** (such as TOFD or Tandem) with the combination of the emitted beam and receiving probe.
- And many other possibilities you can discover…

The **UT inspection simulation** module of CIVA education can help illustrate the following points, among other possibilities:

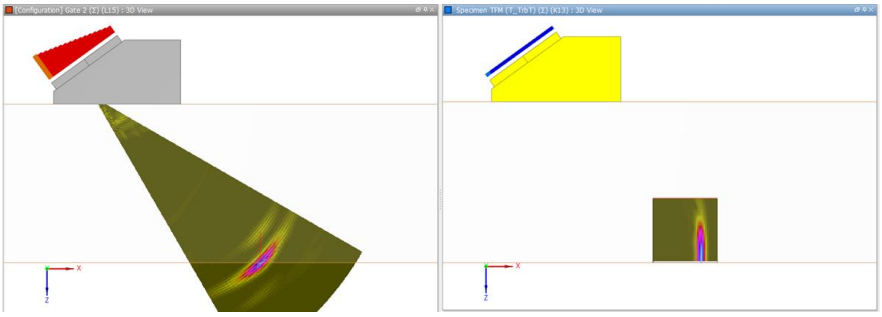
- **Different types of echoes** scattered by an indication or by the component's boundaries (diffraction, reflection, corner effect, etc.).



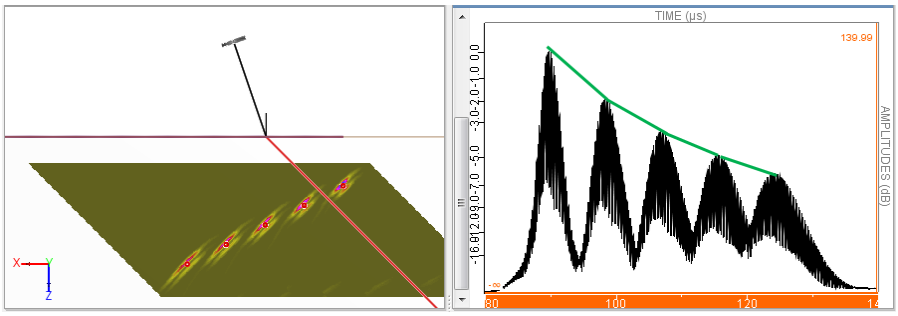
- Identify the **different modes** including mode conversion phenomena.



- Illustrate and compare the **different UT techniques**: **Normal beam, Angled beam, TOFD, Tandem**, **PA S-Scan, PA TFM**, etc.



- Show **calibration block set up** to obtain DAC like curves.



- Understand **defect sizing techniques** such as the −6 dB drop and tip diffraction.
- Show the impact of **influential parameters on the signal sensitivity** (such as flaw location and orientation, probe parameters, etc...).

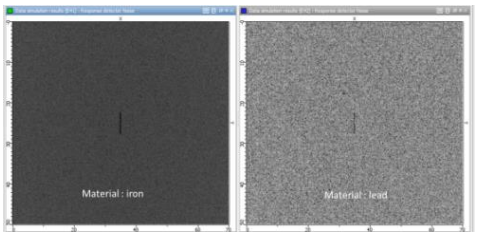
RT module :

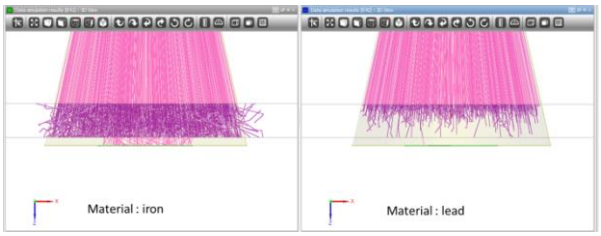
In CIVA Education RT, both direct radiation and first-order scattering radiation are computed for qualitative but realistic and fast simulations. Planar, cylindrical and a V-weld geometry can be selected for the component. Additionally, you can simulate X-Ray and gammagraphy.

Example of Simulations

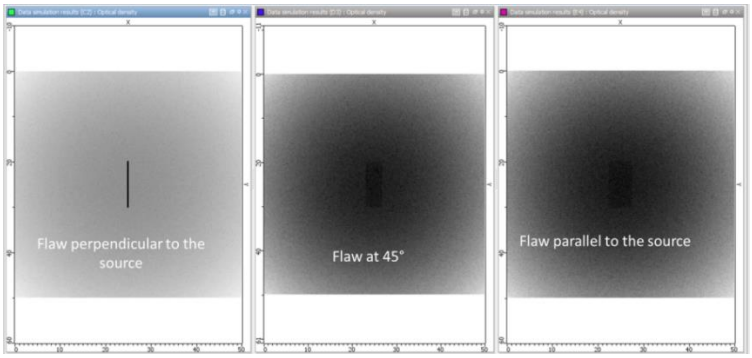
Among many other ideas, the **RT module** of CIVA Education will help you to teach the following topics:

- Visualize the **impact of thickness change** on the radiogram obtained.
- Highlight the **impact of component materials** on the photons path and the radiogram obtained.

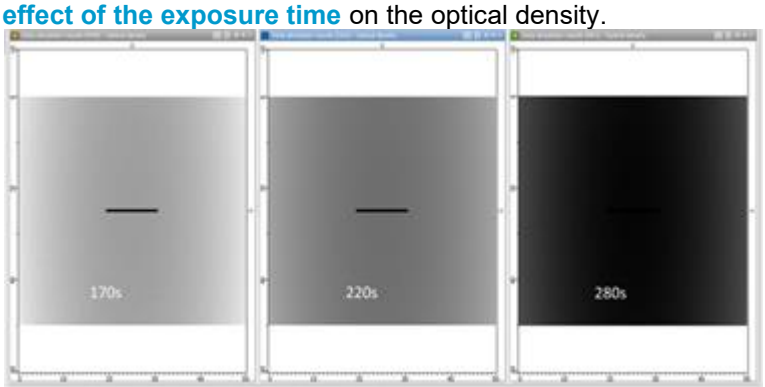




- Illustrate the **sensitivity of the RT technique** depending on the defect's orientation.



- Check the **effect of the exposure time** on the optical density.



- Evaluate the **impact of the source's orientation** on a pipe component to locate the flaw.
- Understand the impact of **geometrical unsharpeness** and its origin.
- Illustrate the impact of different **sources of different energies on the final RT image.**
- Discover numerous other capabilities.

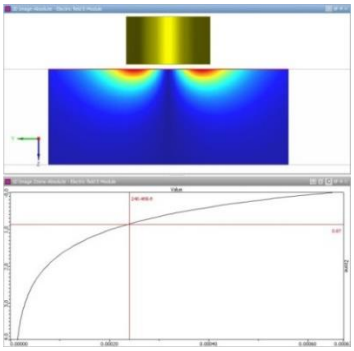
ET module

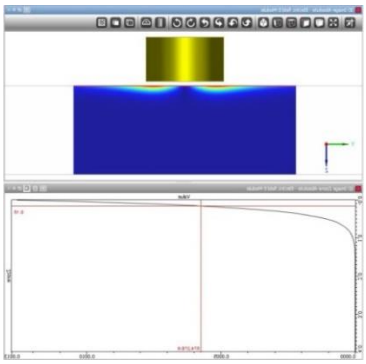
The ET part comes with 3 modules: Field computation, Probe Response and Inspection Simulation. It supports simulations for both planar surface and tube inspections.

Example of Simulations:

The **ET Field Computation** module in CIVA Education reveals hidden and complex aspects of the electromagnetic technique:

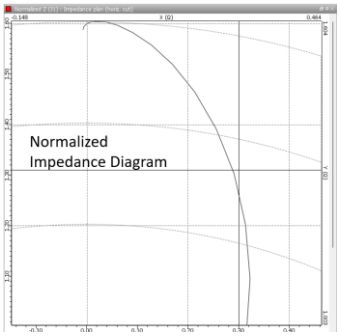
- Illustrate the Eddy Current's **penetration depth** and observe how frequency, material, and sensor size affect the actual penetration depth.

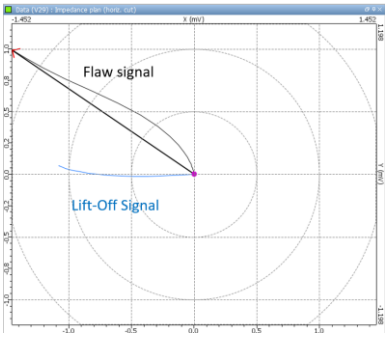




- Visualize the **action zone** of an ET sensor.
- Observe **Eddy Current distribution** in a tube or a solid bar.
- See the influence of a **ferrite core** on the field induced by an ET sensor.

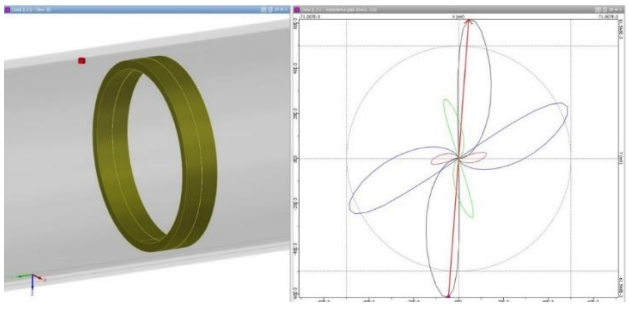
The ET Probe Response module helps you understand and interpret **Impedance diagrams**. It includes the ability to visualize the **phase separation of lift-off and defect signal** based on the sensor and the operating frequency:



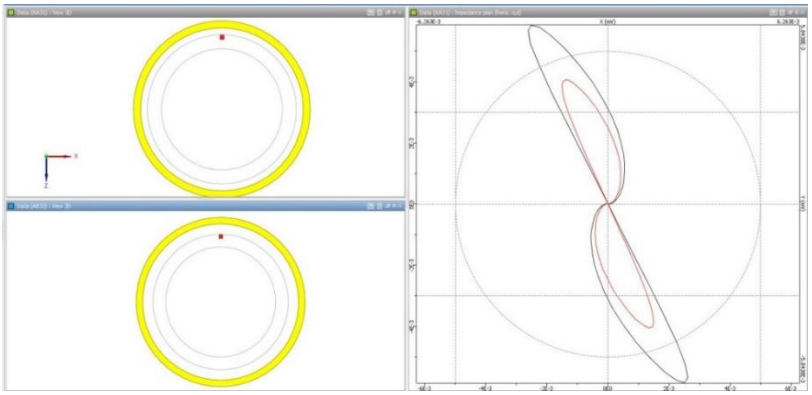


The **ET inspection simulation** module of CIVA Education can reproduce typical Eddy Current signals and help you explain the following concepts:

- Different types of acquisition modes: **Separated or common functions, absolute or differential measurement**.
- Simulate a classical **tube inspection** setup and explain how phase angle is used for defect characterization.



- Illustrate how **sensor size affects** the response for a given flaw.
- Evaluate the **impact of material conductivity** on the signal obtained for a similar defect.
- Highlight the **influence of the filling rate** on the inspection sensitivity.

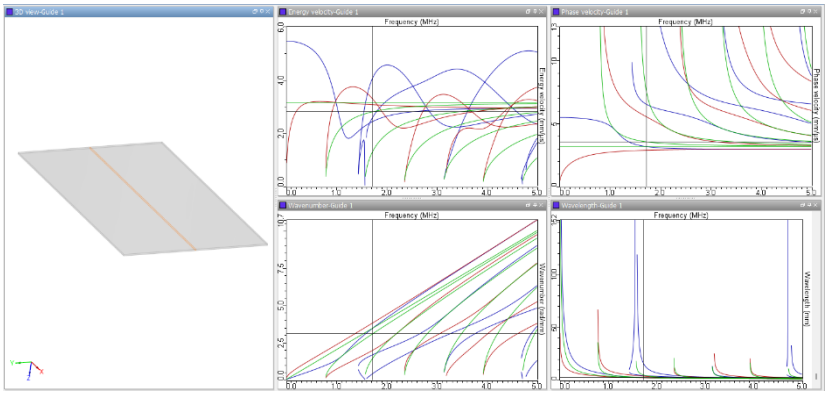


GWT module

The GWT module of CIVA Education supports the computation of dispersion curves in planar and cylindrical isotropic components for a given range of frequencies:

Simulation Examples:

- Compute **Lamb Wave and SH Wave** properties in planar components for different materials and thicknesses:



- Visualize **Longitudinal or Torsional modes** in tubes of different materials and thicknesses, which can be filled with a fluid medium: