QUANSCIENT
WEBINAR

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Aug 24,2023

Cloud-based FEM for Ultrasonics:

15x15 PMUT array with +30M unknowns solved in less than 4 minutes

See the groundbreaking effects cloud-computing can have on ultrasonics simulations

Technical speaker

Dr. Alexandre Halbach

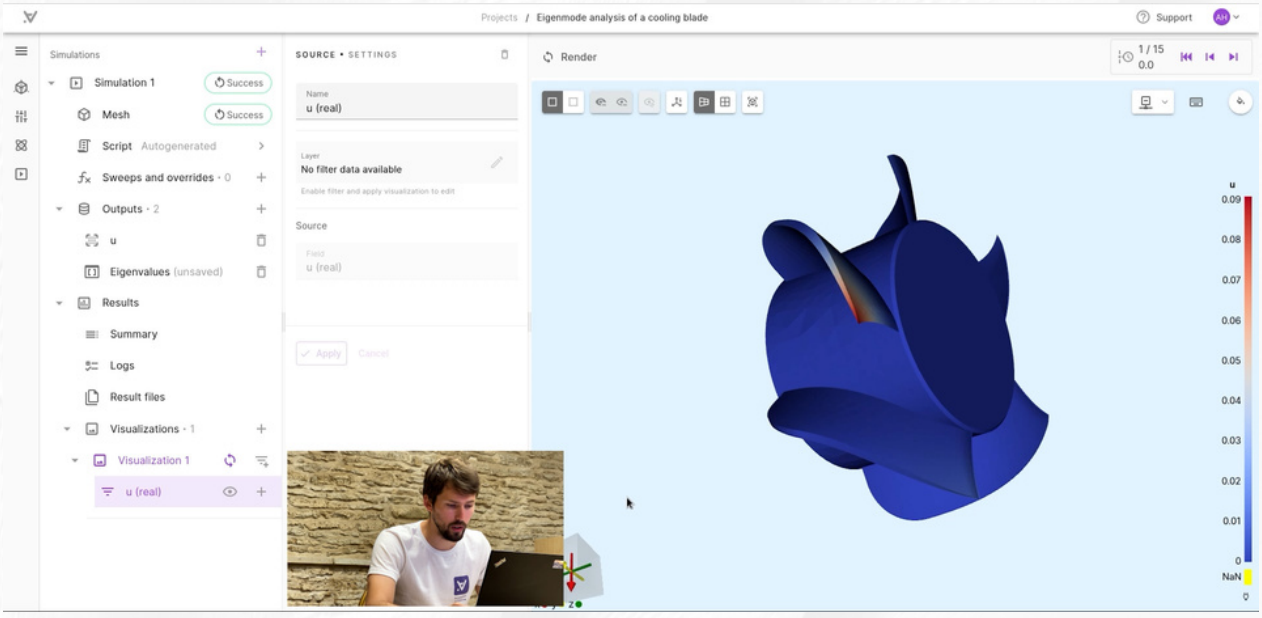
CTO, Co-Founder

Alexandre is our CTO and simulation algorithms expert. He has developed our state-of-the-art multiphysics simulation algorithms and has years of hands-on R&D experience.

OVERVIEW

This webinar provided a practical demonstration of Quanscient Allsolve's application in ultrasonic simulations. It covered an eigenmode analysis of a cooling blade, a multiphysics simulation of an ultrasound transducer, and a large-scale simulation of a 15x15 PMUT array, effectively demonstrating the software's capabilities in handling complex simulations with over 31 million degrees of freedom efficiently using cloud computing.

KEY DEMONSTRATIONS AND RESULTS



Eigenmode Analysis of a Cooling Blade:

Objective: To introduce the workflow in Quanscient Allsolve through a basic mechanical simulation.

Process: Dr. Halbach demonstrates the creation of a project, importing a step file, and de-featuring a cooling blade. He focuses on how Allsolve simplifies this process, making complex simulations accessible.

Key Benefits: The simulation highlights the platform's user-friendly interface, versatile meshing options, and the efficient setup of materials and physics, culminating in a swift eigenmode analysis.

Results: The analysis reveals several clusters of resonance frequencies, each corresponding to different vibration modes of the blade, effectively showcasing the software's precision and computational power.

Multiphysics Simulation of a Single Ultrasound Transducer (PMUT):

Objective: To demonstrate a multiphysics simulation involving piezoelectric and acoustic interactions.

Process: The setup involves defining materials (including monocrystalline silicon and PZT piezoelectric material), setting up physics (solid mechanics, electrostatics, and acoustic waves), and applying boundary conditions. Dr. Halbach explains each step, demonstrating the platform's comprehensive capabilities.

Key Benefits: This simulation exemplifies the platform's ability to handle complex multiphysics interactions seamlessly. The ease of setting up perfectly matched layers (PMLs) for wave equations is highlighted, along with the platform's flexibility in editing material properties.

Results: The simulation results showcase the transducer's vibration and emitted pressure field, illustrating Allsolve's capability to render detailed physical phenomena.

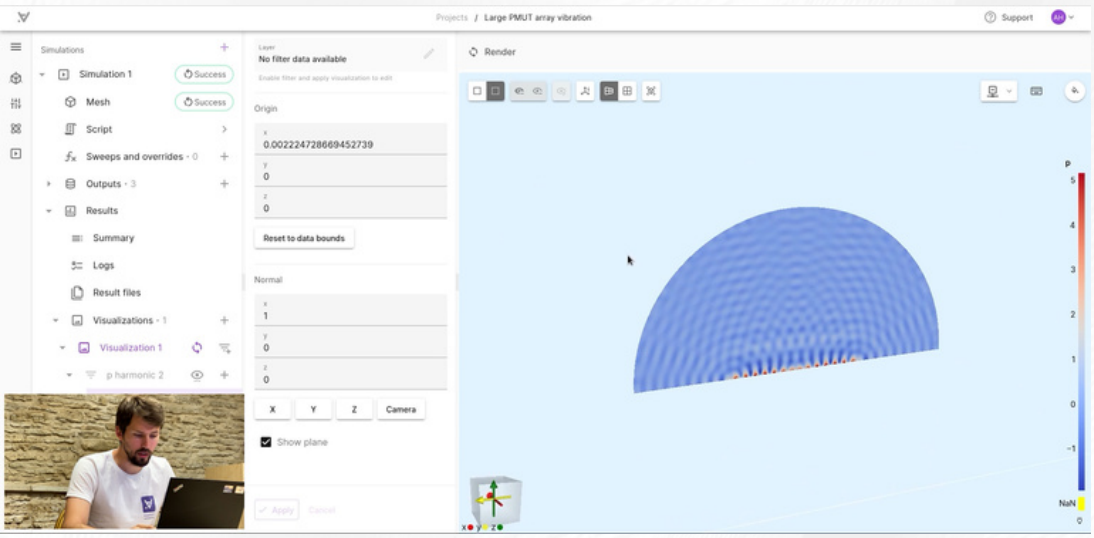


Photo: 15x15 PMUT Array

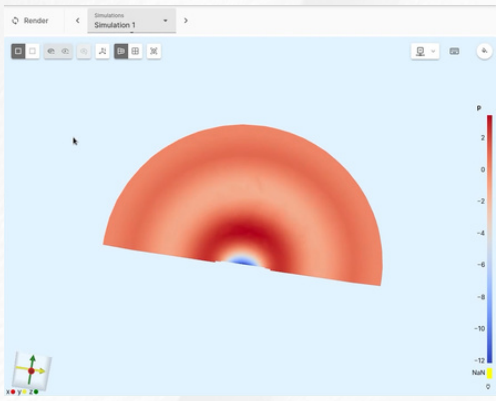


Photo: Single Ultrasound Transducer

Large-Scale Simulation of a 15x15 PMUT Array:

Objective: To demonstrate the platform's scalability and speed in handling extensive simulations.

Process: This simulation scales up the previous setup to a 15x15 array of PMUTs, significantly increasing the complexity and number of unknowns. Dr. Halbach navigates through the process, showcasing the platform's ability to handle large-scale simulations without compromising speed or accuracy.s comprehensive capabilities.

Key Benefits: The demonstration emphasizes Allsolve's robust computational power, capable of handling over 30 million unknowns efficiently. The platform's scalability and ability to perform multiple simulations in parallel are showcased.

Results: The final visualization presents a detailed pressure field across the array, highlighting the software's capability to manage and visualize extensive data sets rapidly.

Number of Cores Used: 100
Degrees of Freedom (DoFs): 31,149,998
Runtime: 222.95 seconds (approximately 3.7 minutes)

TAKE THE NEXT STEP WITH QUANSCIENT ALLSOLVE

If you're considering whether Quanscient Allsolve could be a beneficial addition to your workflow, we invite you to schedule a complimentary 30-minute consultation with us. This no-obligation call is an excellent opportunity to discuss your specific needs and see how Allsolve can be tailored to meet them.

Book your session now

Not ready for a call just yet but still curious? Fill out this form to describe your use case. Our technical team will review your information and respond within one business day.