



CASE STUDY /

Ansys + ANYWAVES

“In the space industry, physical testing is extremely complicated and expensive, especially for a startup. However, the design of antennas requires the integration of a multitude of physical criteria to verify that the components function correctly in all situations. This is why meticulous preparatory work is essential. Virtual testing with Ansys Mechanical and Ansys HFSS allows our engineers to test many design variants that meet space standards, from the digital model to the final prototype of the antenna on the satellite. These cutting-edge technologies, combined with customized support, have made Ansys an indispensable partner in the rapid development and industrialisation of our antennas.”

Nicolas Capet
CEO / ANYWAVES

ANYWAVES Uses Ansys Simulation Software to Develop Next-Generation Miniature Antennas

Founded in 2017, ANYWAVES is a French equipment manufacturer that develops miniature antennas for satellite constellations. Some of these revolutionary antennas are manufactured using cutting-edge, ceramic 3D printing technology patented by ANYWAVES. Thanks to this unique expertise, the Toulouse-based startup has the ability to produce bespoke and ready-made miniature antennas for all types of satellites. With customers across the globe, including Airbus Defense and Space, Thales Alenia Space, Hemeria, Pixxel and Loft Orbital, ANYWAVES aims to become the world leader of miniature antennas for the satellite constellation market.

/ Challenge

Space antennas are critical pieces of equipment that have a direct impact on satellite performance. Whatever the mission (telecommunications, positioning/navigation, Earth observation, etc.), antennas must perform essential functions throughout a satellite's lifetime. Once in orbit, they cannot be repaired. A failure or malfunction could heavily impact the performance of the satellite or even cause a total shutdown. The reliability and ergonomics of the antennas are therefore key qualities for ANYWAVES that must be optimized during development.

However, designing high-frequency antennas involves a number of engineering challenges, as well as the additional constraints imposed by the extreme nature of the space environment. In particular, antennas must withstand significant thermal and atmospheric variations, as well as intense mechanical bearings (vibrations, shocks, etc.). The miniature size, design and certification of the antennas also present a number of barriers that often materialize during production.

All these factors also have an impact on development times and costs, which is why they must be taken into account as early as possible. The ANYWAVES team therefore needed a solution to model and simulate the complete antenna to reduce the time-consuming and costly physical testing phases.

/ Solution

Since its launch, ANYWAVES has relied on multiphysics digital simulation. The company chose Ansys to help deploy this technology.

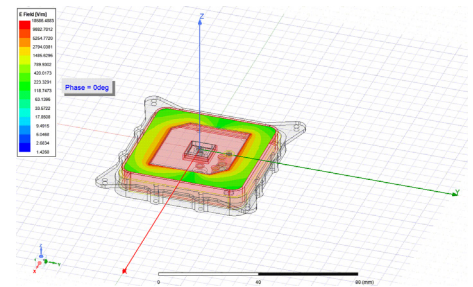
Ansys Mechanical software is used throughout the design phase to model the mechanical structure of the antenna components and simulate its behavior in certain situations (deformations, vibrations, resistance, lifespan, etc.). Thanks to an extensive material library and powerful solvers, the solution allows engineers to test the dynamic effects (thermal, acoustic, etc.) and topological parameters of the antenna in its real-world environment. This allows the team to explore the behavior of the antenna in numerous concepts and hypothetical scenarios to improve the design and reduce errors.

In addition, ANYWAVES uses Ansys HFSS electromagnetic (EM) simulation software to study the electronic operation of the antenna as a whole. Ansys HFSS is able to merge meshes of different scales (from nanometers to meters), which allows all components to be combined - from the antenna electronic circuits to the satellite envelope - and the EM interactions can be predicted in the same simulation.

The combination of the software allows ANYWAVES to have complete simulations that are true to the real performance of the antennas.



Nicolas Capet, CEO of ANYWAVES.



Electromagnetic fields simulation on a navigation antenna designed for satellite constellations.



Navigation antenna designed thanks to additive manufacturing.

/ Results

Thanks to Ansys' Startup Program, ANYWAVES was able to benefit from discounted rates of Ansys software for the first two years, meaning that the company could quickly deploy its first operational models at optimal cost. Building on this initial success, the company acquired the software licenses in 2019 for its design office and continues to work closely with the Ansys technical support team.

Today, simulation provides ANYWAVES with the power and ability to test antennas in thousands of scenarios. The technology ensures that the antennas will meet performance, reliability and durability requirements, making it a key innovation driver and decision support tool. Thanks to simulation, the team is able to propose innovative and differentiating designs that meet its customers' criteria and comply with regulatory requirements.

Simulation has also allowed ANYWAVES to considerably reduce the cost related to physical testing by reducing the number of prototypes and test benches required for the validation of the antennas.

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/ About ANYWAVES

ANYWAVES develops revolutionary antennas for the satellite constellations market.

Based on a breakthrough technology and an expert team, ANYWAVES designs and manufactures according to space standards a new generation of high quality antennas, on demand or off-the-shelf.

Unique European « pure player » antenna equipment manufacturer, ANYWAVES has sold more than 90 flight models since its inception in 2017 and reached a 1-million euro turn-over in 2020.

Based in Toulouse (France), the European Space capital, the company aims to become the leader of miniature antennas for critical systems.

Visit anywaves.eu for more information

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