NANODIMENSION

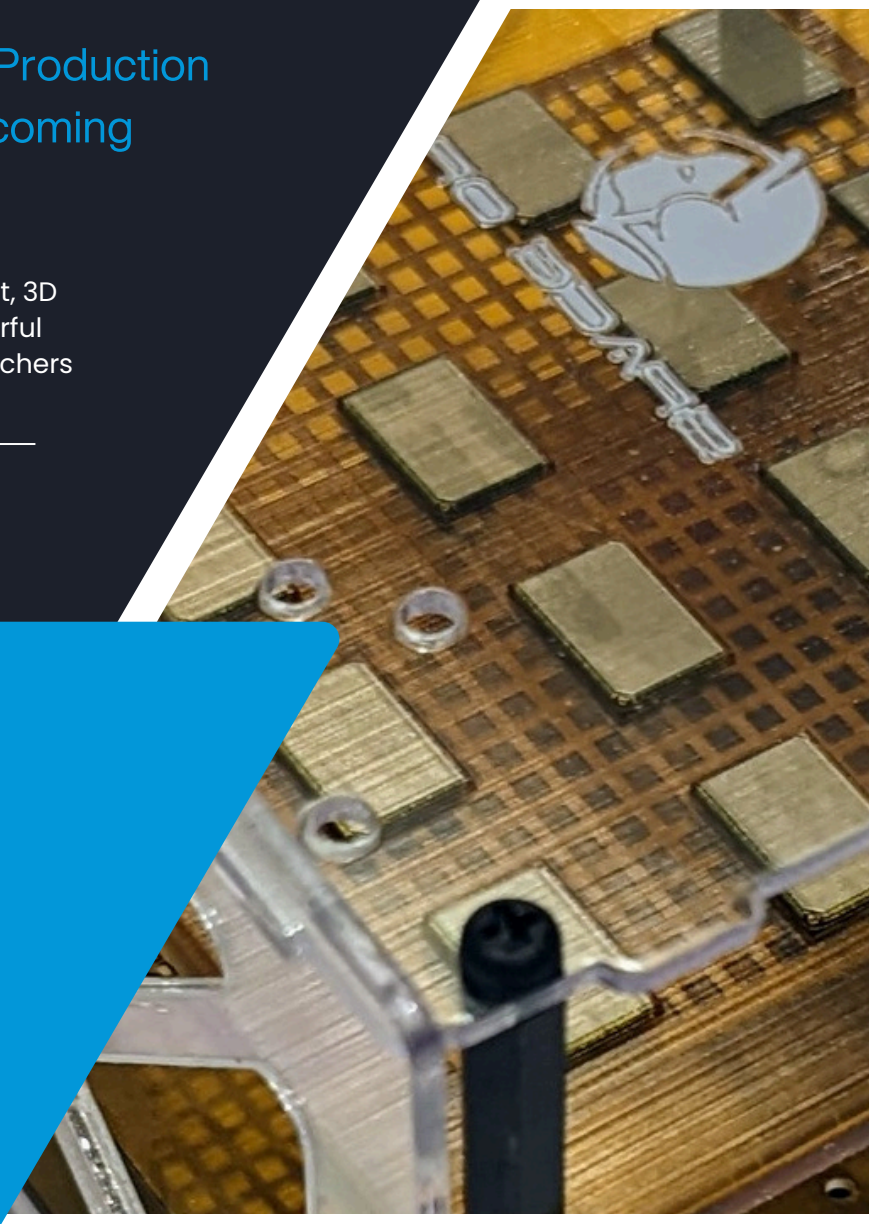
AME APPLICATION

CubeSats

Challenges in Cube Satellite Production and the Role of AME in Overcoming Them

In the realm of Cube Satellite development, 3D printing of electronics emerges as a powerful solution to the challenges faced by researchers and engineers.

Nano Dimension Additive Division



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A key player in space

The vast expanse of space has always been a realm of wonder, inspiring humanity to explore its mysteries and push the boundaries of technological innovation. In recent years, Cube Satellites have emerged as key players in shaping the future of space activities. These miniature marvels, which are no bigger than 10x10x10 cm square, are transforming the landscape of space exploration, making it more accessible, cost-effective, and versatile than ever before. In this paper, we delve into how Cube Satellites are being developed to play a pivotal role in the future of space activities.

The challenges

While Cube Satellites hold immense promise for the future of space activities, their development is not without challenges. Traditional manufacturing processes for space-grade electronics and components can be intricate, time-consuming, and costly. CubeSat developers often face constraints related to size, weight, and budget, making in-house production a formidable task. However, the advent of AME technology has emerged as a game-changer, offering innovative solutions to overcome these hurdles.

Optimize the Formfactor

1

Cube Satellites, despite their small size, require intricate electronic systems to function optimally. The challenge lies in integrating these complex electronics within the limited space available.

Traditional methods often involve assembling multiple components, which can be cumbersome and may compromise the overall efficiency of the satellite.

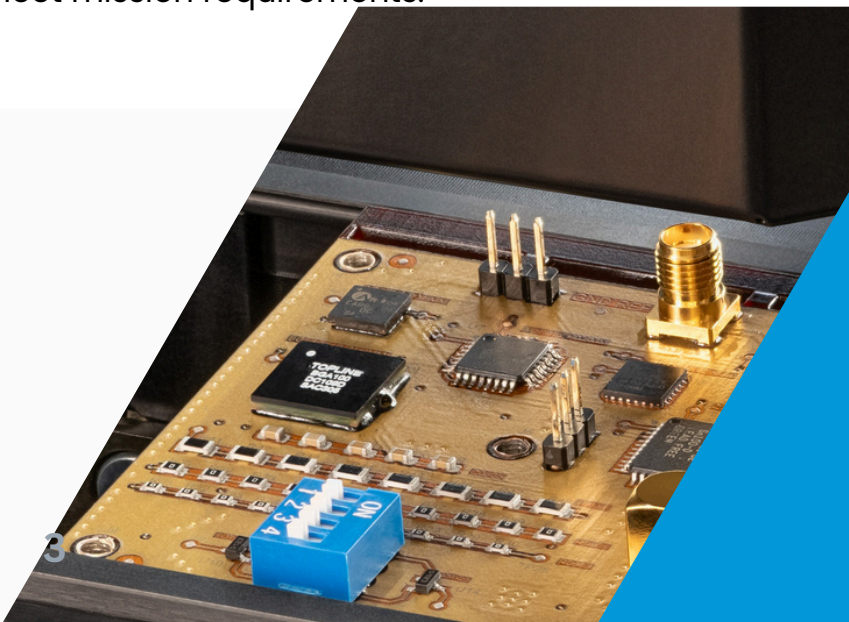
Solution: Additive manufacturing of electronics (AME) allows for the creation of 3D intricate and compact electronic structures. This eliminates the need for traditional circuit boards, reducing both weight and complexity. The ability to print electronics in-house offers CubeSat developers the flexibility to design custom solutions that precisely fit the available space, optimizing performance without compromising on functionality.

Prototype Unique Designs

2

Cube Satellites often require customization to meet specific mission objectives. Traditional manufacturing processes struggle to provide the features needed for rapid prototyping and iterative design. This limitation can hinder the ability to test and refine CubeSat designs efficiently.

Solution: Features such as blind vias, buried vias, coax or twisted pairs, planar parts, nested footprints, parts on board edges are easy to additively manufacture. Rapid Prototyping with AME enables CubeSat developers to quickly iterate through design variations. This not only expedites the development process but also facilitates the testing of different configurations to optimize performance. The flexibility offered by AME empowers teams to experiment with various designs, ensuring the final Cube Satellite is finely tuned to meet mission requirements.



Cost Constraints

3

Budget considerations are a significant factor in Cube Satellite development. Traditional manufacturing methods may involve high upfront costs, especially for producing custom components. This financial barrier can limit the accessibility of Cube Satellite development to smaller organizations and academic institutions.

Solution: AME presents a cost-effective alternative for CubeSat developers. The ability to manufacture components in-house reduces dependence on external suppliers, minimizing costs associated with prototyping and small-batch production. This democratization of manufacturing aligns with the core principles of CubeSat development, making space exploration accessible to a broader range of stakeholders.

Time Constraints & Schedule Recovery

4

The traditional manufacturing timeline for space-grade electronics can be lengthy, leading to potential delays in Cube Satellite projects. The dynamic nature of space exploration demands agility in development and deployment, making quick turnaround times essential. It's crucial to emphasize that the rigid deadlines associated with space missions, including the submission of CubeSat projects, underscore the meticulous planning and coordination required in the aerospace industry. Cube Sat are often secondary payloads and are at the mercy of the larger launch schedule – any delays can derail the project.

Solution: AME accelerates the development timeline by streamlining the production process. The ability to fabricate complex electronic components layer by layer significantly reduces lead times. Through rapid prototyping and in-house design and build iterations developers can recover schedules and make the launch window.

Effortless In-house Prototyping

DragonFly IV

The DragonFly IV is a cutting-edge 3D printer redefining how electronics are designed and manufactured. As a multi-material, multi-layer additive manufacturing system, it enables the creation of entire circuits in a single print—integrating substrates, conductive traces, and passive components seamlessly. With the DragonFly IV, engineers and designers can move beyond the constraints of traditional electronics fabrication, unlocking unprecedented design flexibility and enabling a completely new way to build complex, customized electronic devices.