

Development of a High-Performance Antenna for Airbus Defence and Space

INTRODUCTION

Airbus Defence and Space (hereinafter Airbus), a division of Airbus SE, is a global leader in the aerospace sector, specializing in defense and space exploration. Their renowned expertise in satellite and space technology is evident, and as a longstanding client, Airbus has maintained a strong partnership with RF SPIN, acquiring cutting-edge antennas for diverse applications.



KEY ANTENNA PARAMETERS

- **Frequency Range:**
Effective operation within the 500-700 MHz frequency range
- **Weight Limitation:**
Strict 35 kg weight limit
- **Impedance Matching:**
Better than -18 dB
- **Gain Requirement:**
High Gain of over 12 dBi
- **Cross-Polarization:**
On axis -35 dB, off axis (10 degrees) -30 dB

1 PROJECT SPECIFICATION

Airbus collaborated with RF SPIN to design a single-polarized antenna which is intended to be used as a range antenna in a Compact Range. Key specifications included stringent requirements for operational parameters like gain and cross-polarization, essential for peak performance in laboratory measurements. These specs also influenced the antenna's physical dimensions, while a weight limit which was dictated by Airbus' measurement system capacity shaped its design and ensured its compatibility with the existing infrastructure.

2 CHALLENGES

RF SPIN faced a significant design challenge in achieving a high-gain antenna while maintaining a manageable size and weight. The necessary frequency band and at the same time a relatively high gain required a larger antenna size, which inherently added to its weight.. This scenario required a careful balance to optimize the antenna's dimensions and weight without compromising its high-gain performance capabilities.

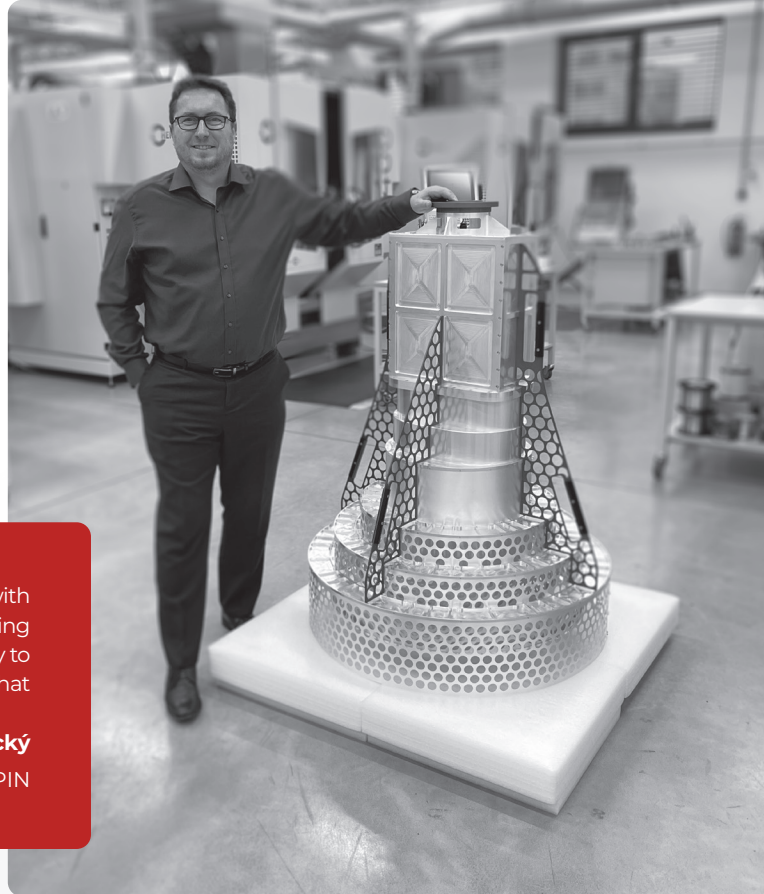
During manufacturing, a critical obstacle arose. It became clear that no approached manufacturer could produce the antenna as designed without exceeding the weight limit, rendering the antenna impractical for its intended use. This reality was underscored when another manufacturer proposed an antenna weighing 90 kg, well beyond the required limit.

This situation not only highlighted the project's complexity but also emphasized the necessity for innovative manufacturing techniques and advanced materials that could deliver the desired performance without compromising on weight. It became evident that a highly specialized approach was required to meet the unique balance of technical specifications and physical constraints.

3 SOLUTION

Airbus acknowledged the vital importance of an end-to-end solution, integrating both the design and manufacturing phases of the antenna in a seamless manner. This approach enabled the iterative development of experimental design and production versions, ensuring continuous improvement and refinement. This realization underscored the importance of open collaboration with RF SPIN throughout the project.

RF SPIN rose to the challenge, drawing upon their expertise and experience gained from previous high-profile projects, including antenna development for NASA where weight was also a significant factor. They fully utilized their R&D expertise, new manufacturing facility, state-of-the-art machinery, and cutting-edge technologies to execute the project.



“Facing challenges is what we do best at RF SPIN. Working with Airbus wasn’t just about designing an antenna. It was about changing the game. We live by ‘Innovate, not compromise.’ It led us not only to meet Airbus’s strict requirements but to also create something that stands out for its engineering.”

Zdeněk Hradecký
Owner and CEO, RF SPIN

DESIGN OPTIMIZATION (INCLUDING FEASIBILITY STUDY)

RF SPIN’s R&D team embarked on a transformative redesign journey, aiming to achieve a lightweight construction method for the antenna. This endeavor drew inspiration from their rich experience in previous projects. The team strategically incorporated features such as precise hole positioning and sizing, as well as meticulous metal sheet alignment to create a highly efficient design. The R&D department collaborated closely with the production team, utilizing specialized software for design and CAD for manufacturing.



INNOVATIVE MANUFACTURING PROCESS

RF SPIN’s manufacturing process demonstrated ingenuity and precision. Laser cutting was employed to fabricate the antenna’s metal sheets externally. However, a challenge arose during passivation, as certain components exceeded standard bath dimensions. External solutions were impractical due to incompatible surface treatments. RF SPIN adeptly overcame this obstacle by segmenting the antenna into interconnected parts for proper passivation, meticulously ensuring the quality of surface treatment adhered to the highest standards.



“It was not a given to meet our electrical performance requirements while still fulfilling the weight requirement for this antenna. Thanks to the creativity and thinking-outside-of-the-box approach of RF SPIN, the antenna design meets all our requirements. Airbus is very pleased with the antenna design by RFSPIN, and we are looking forward to further collaborations.”

Thomas Thiry
Project Manager, Airbus Defence and Space

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RESULTS AND OUTCOME

RF SPIN's end-to-end approach, including a comprehensive feasibility study, revealed that the project's ambitious goals were indeed feasible. From Airbus's perspective, this project delivered transformative outcomes:



CUTTING-EDGE TECHNOLOGICAL ADVANCEMENT

The project culminated in the development of an exceptionally advanced antenna. With a final weight of 31 kg, it achieved the seemingly impossible balance between size, weight, mechanical resistance, and performance – a technological marvel that only a select few companies can boast. This achievement directly addressed Airbus's needs and exceeded their specifications.

STREAMLINED COLLABORATION AND HOLISTIC SOLUTION

Among the most notable impacts of this project was the seamless collaboration between RF SPIN's R&D and manufacturing departments. The integration of design and production processes simplified the entire project for Airbus. It reduced complexities, eliminated coordination challenges, and streamlined the entire endeavor, ultimately saving valuable time and resources.

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CONCLUSION

In conclusion, this project has been a game-changer for both RF SPIN and Airbus. RF SPIN's team has successfully pushed the boundaries of technology, delivering an advanced, lightweight but high-performance antenna that sets new industry standards. Furthermore, this endeavor has positioned RF SPIN as a singular, reliable partner for Airbus, capable of both conceptualizing and precisely manufacturing the antenna to exact specifications. This collaboration effectively eliminated the need for multiple vendors, streamlining Airbus's procurement and development process.

ABOUT RF SPIN


With over 20 years of industry experience, RF SPIN is recognized as a global leader in designing and producing innovative broadband antennas. Our expertise covers everything from design to in-house manufacturing, ensuring end-to-end quality control.

Our worldwide reputation for excellence is highlighted through the selection of our products by leading companies. Renowned for deep technical expertise, we continue at the forefront of advancing RF technology, reinforcing our status as trusted experts.



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