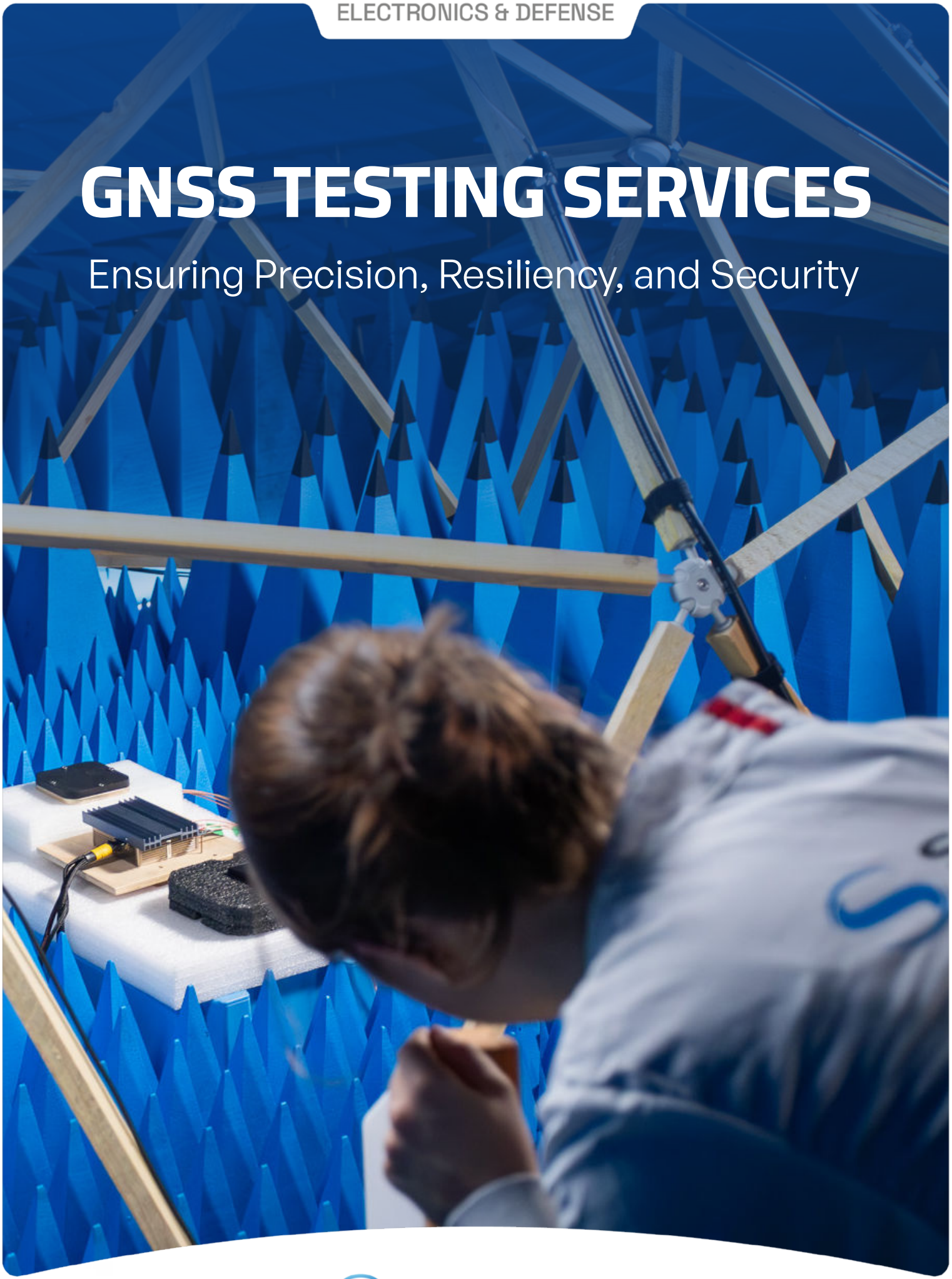
ELECTRONICS & DEFENSE

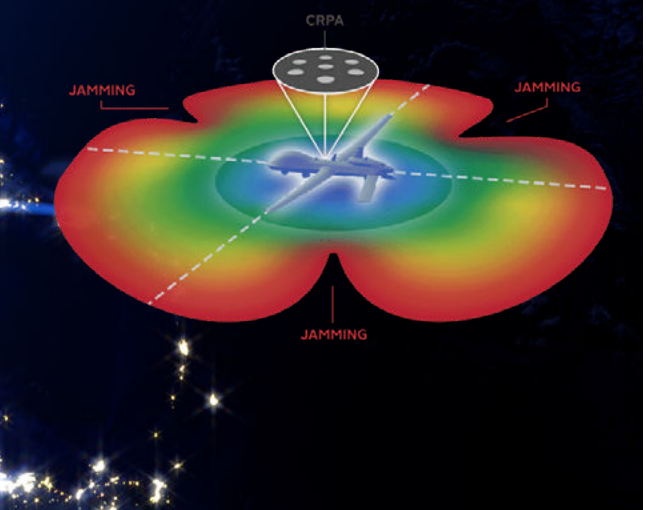
# GNSS TESTING SERVICES

## Ensuring Precision, Resiliency, and Security



SAFRAN

# WHY GNSS TESTING MATTERS




Global Navigation Satellite System (GNSS) technology is critical to industries such as defense, aerospace, and automotive, where precision, reliability, and security are essential. However, real-world GNSS signals are vulnerable to interference, jamming, and spoofing, posing significant risks to mission-critical applications. To ensure robust performance, GNSS testing must be conducted in controlled environments that replicate real-world threats while eliminating unpredictable variables.

CRPA (Controlled Reception Pattern Antenna) and Over-the-Air (OTA) testing provide essential validation by enhancing resistance to interference and ensuring system resilience.

However, executing these tests presents challenges, including complex test setups, high-fidelity signal simulation, and the need for specialized facilities.

**Safran brings extensive expertise in Positioning, Navigation, and Timing (PNT) and defensive NAVWAR, ensuring resilient and reliable navigation capabilities in contested environments. Leveraging decades of innovation, Safran delivers advanced solutions to detect, mitigate, and counter jamming and spoofing threats across all domains.**

## SAFRAN LAB SERVICES AVAILABLE

**Conducted** testing and **Over-the-Air (OTA)** testing are two distinct approaches to evaluating GNSS performance.

- **Conducted** testing involves directly connecting a GNSS receiver or antenna to a signal simulator via cables, allowing precise control over signal conditions while eliminating external interference. This method is ideal for testing receiver performance in a controlled, repeatable manner.

- **OTA testing**, on the other hand, evaluates GNSS performance in a wireless environment, typically within an anechoic chamber. It accounts for real-world factors such as antenna characteristics, multipath effects, and spatial signal variations, making it essential for validating system performance in operational conditions.

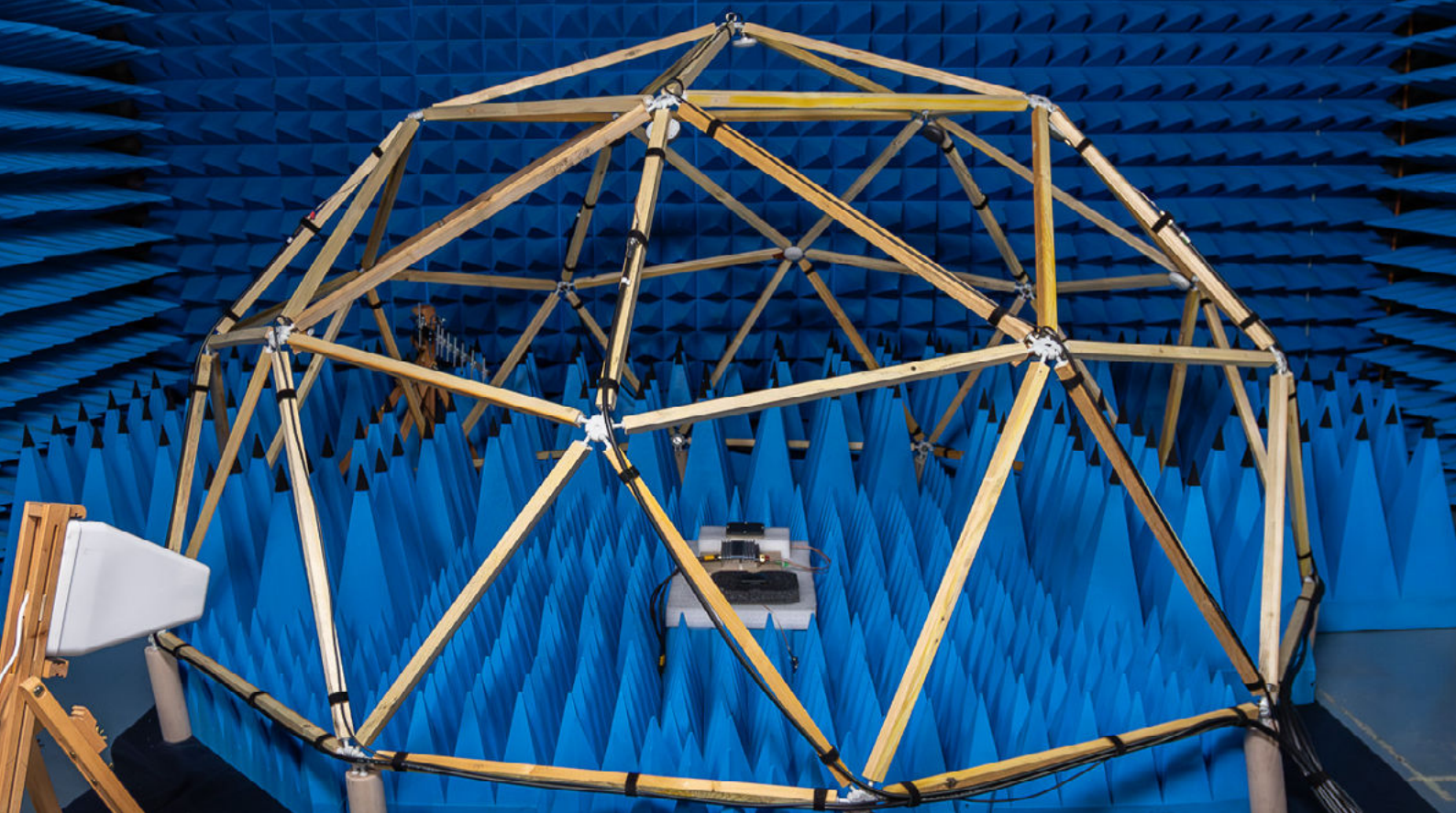
**What is CRPA Technology?**
Controlled Reception Pattern Antennas (CRPAs) use advanced beamforming techniques to dynamically filter and mitigate interference. By adjusting their reception pattern in real time, CRPAs enhance GNSS signal integrity, making them ideal for military, aerospace, and high-security applications.

**Ensuring Anti-Jamming & Anti-Spoofing Performance**
CRPA testing evaluates how well an antenna rejects jamming and spoofing threats by simulating real-world interference scenarios. This ensures that GNSS receivers maintain accuracy and functionality in hostile environments, providing reliable positioning and navigation even in contested signal conditions.

| TYPE OF TEST | CONDUCTED | | OVER THE AIR |
|---|---|---|---|
| | CRPA testing, jamming/ spoofing | General GNSS simulation and testing | All-encompassing GNSS testing |
| Device Under Test (DUT) | • CRPA electronic device | • Standard GNSS receivers | • CRPA antenna + electronic device<br>• GNSS receivers<br>• Full systems |
| Features Supported | • Multi-frequency/ constellation<br>• Multi-antenna testing<br>• Jamming/spoofing<br>• Real-time HIL<br>• IMU support | • Multi-frequency/ constellation<br>• Multi-antenna testing<br>• Jamming/spoofing<br>• Real-time HIL<br>• IMU support | • Full RF isolation<br>• Wide-band support<br>• Jamming/spoofing, CRPA<br>• Multi-environment simulation<br>• IMU support |
| Application Engineering Support | • Training<br>• Guidance on Operation, Scenario Creation, and Configuration<br>• On-Site Support | • Training<br>• Guidance on Operation, Scenario Creation, and Configuration<br>• On-Site Support | • Training<br>• Guidance on Operation, Scenario Creation, and Configuration<br>• On-Site Support |

## WHY USE AN ANECHOIC CHAMBER?

An anechoic chamber provides an ideal environment for GNSS testing by eliminating external interference and unwanted signal reflections. This controlled setting ensures high precision, allowing for repeatable and consistent test conditions that are impossible to achieve in open-air environments. By simulating real-world scenarios without unpredictable variables, anechoic chambers enable accurate evaluation of GNSS receivers, antennas, and anti-jamming technologies. Additionally, they support **Over-the-Air (OTA) testing**, ensuring that systems perform reliably in operational conditions while maintaining compliance with industry standards.



# HOW TESTING WITH SAFRAN GNSS SERVICES CAN HELP

Safran provides industry-leading expertise, state-of-the-art equipment, and world-class facilities to conduct both **conducted** and **over-the-air (OTA)** testing. Whether evaluating receiver performance through direct signal injection or assessing complete system behavior in an interference-free anechoic chamber, our specialized solutions help you achieve superior resilience against jamming, spoofing, and other GNSS threats.
Safran GNSS Simulation Services offers a wide range of benefits including improved resilience, compliance with military standards, and enhanced system reliability.

## TESTING BENEFITS

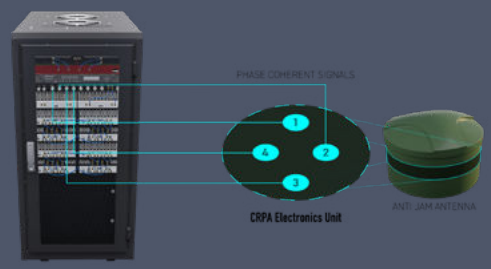
### Conducted GNSS Testing

• Precise Signal Control – Direct cable connections eliminate external interference, ensuring consistent signal conditions.

• Repeatability – Test scenarios can be easily replicated for consistent performance evaluation.

• Detailed Performance Analysis – Enables in-depth evaluation of receiver sensitivity, multipath effects, and jamming resistance.

• Ideal for Early Development – Useful for verifying GNSS receiver performance before integration into a complete system.




### Over-the-Air (OTA) GNSS Testing

• Realistic Signal Environment – Simulates real-world conditions, including multipath, polarization, and spatial variations.

• Interference-Free Testing – Anechoic chambers eliminate external GNSS signals and RF noise for controlled experimentation.

• Full System Evaluation – Tests the entire GNSS system, including the antenna, rather than just the receiver.

• Supports CRPA Performance Testing –
  – Evaluates beamforming and nulling capabilities against jamming and spoofing threats.
  – Test the CRPA antenna's capability to determine a jammer's DOA (direction of arrival).

• Essential for Field-Ready Validation – Ensures reliable performance in operational conditions, reducing risks before deployment.

## SAFRAN GNSS SIMULATION SERVICES CAN BENEFIT THE FOLLOWING INDUSTRIES

- Aerospace & Defense
- Telecom and Timing
- Space
- Automotive & Autonomous vehicles
- Maritime & Shipping
- Critical Infrastructure
- UAVs
- Rail & Transportation
- Research and Academia

# OUR EXPERTISE

Safran brings decades of extensive expertise in GNSS simulation with a strong focus on CRPA (Controlled Reception Pattern Antenna) testing and anechoic chamber validation. A longtime leader in resilient PNT (Positioning, Navigation, and Timing) solutions, Safran offers advanced interference detection and mitigation technologies, and cutting-edge GNSS simulation platforms which provide high-fidelity, real-time GNSS signal generation – essential for CRPA testing.
Safran integrates these capabilities into expert GNSS simulation and testing services, enabling precise over-the-air (OTA) validation in controlled anechoic environments, as well as CRPA antenna testing leveraging the multi-element GSG-Wavefront platform.
This expertise ensures that defense, aerospace, and automotive industries can evaluate GNSS receiver performance against jamming, spoofing, and multipath threats with unparalleled accuracy. By combining high-performance hardware, flexible software, and specialized test facilities, Safran delivers end-to-end testing services for the most demanding GNSS testing applications, helping organizations validate and harden their systems against real-world signal disruptions.


## PARTNER WITH SAFRAN FOR UNMATCHED GNSS TESTING

Ensure your GNSS systems perform with precision, resilience, and reliability. Safran's advanced simulation technology, expert engineering team, and state-of-the-art anechoic chamber facilities provide the ideal environment for rigorous testing.
Let's discuss how we can support your testing needs.
Contact us today to learn more about our CRPA testing, OTA validation, and GNSS simulation solutions.

- **Email us:** SimulationSales@nav-timing.safrangroup.com
- **Visit us online:** safran-navigation-timing.com/professional services

**Or scan the QR code to schedule a consultation with our experts!**

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