



White paper  
Los Alamos National Laboratory



# Los Alamos National Laboratory

## Nutaq state-of-the-art technology reduces development times by 70%

### Challenge

Develop a proof-of-concept prototype that uses modulated reflectance to reduce the power requirement of battery-dependent wireless devices.

### Solution

Use Nutaq software tools to rapidly build and validate a prototype of modulated reflectance-based technology.

### Results

- Development time reduced by 70%
- Cost saving
- Quick time to market.

Los Alamos National Laboratory (LANL) is charged with certain aspects of the monitoring of nuclear nonproliferation. In particular, LANL is interested in detecting any nuclear tests that may occur and it uses several sensing methods to achieve this goal. One of these methods is to monitor for the telltale radio frequency (RF) emissions that accompany the detonation of any nuclear device. However, it is not only important to detect such detonations, it is also paramount to locate where they take place (geolocation).

The Nutaq VHS-ADC/DAC system, integrated with MATLAB and Simulink, as well as System Generator for DSP tools, gave LANL the interface that it needed to graphically implement a short baseline interferometer for simulation, fixed-point testing, hardware-in-the-loop testing, and eventual deployment.

### Challenge

To reduce the power requirements of battery-dependent wireless devices, LANL needed to develop a proof-of-concept prototype that used modulated reflectance. This proof of concept had to ensure that the functional model was appropriate for high-end FPGA. There was no time to develop RF boards or test and refine the design manually in the three months available before the end of the fiscal year. Thus, LANL was looking for easy-to-use, rapid-development tools and vendor demonstrations.

### Solution

To be able to rapidly prototype their system, it was imperative for LANL to find a vendor, such as Nutaq, with ready-made solutions to its issue. In the end, prototyping and deployment were performed with the same Nutaq hardware, allowing LANL to save considerable time and money.

Nutaq developed a heterogeneous system with FPGA and DSP, and the necessary software to integrate it with Simulink. The MATLAB environment and Simulink model-based design tools allowed LANL to graphically implement a short baseline interferometer for simulation, fixed-point testing, and hardware-in-the-loop (HIL) testing.

## Challenge

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Using MATLAB and the related Nutaq software tools, the SignalMaster, ADACMaster II, and VHS-ADC/DAC to rapidly build and validate a prototype of the modulated reflectance-based technology proved to be the solution to LANL's problem.

“The availability of commercial off-the-shelf (COTS) and modular systems, as well as Nutaq's HIL solution mindset oriented our choice towards its high-performance system. Compared to other solutions, Nutaq's solution is way ahead. Using their integrated solution, we will be able to better focus on our customers' needs and requirements, significantly reducing time and costs, and lowering overall project risks.”

Scott D. Briles, Ph. D., Los Alamos National Laboratory

## Results

**Development time reduced by 70%.** Along with the time saved in demodulation and image reconstruction, the MATLAB interface to the digital converter boards helped LANL experts avoid writing custom code.

**Cost savings.** Because the data collection and analysis was accessible through a single environment, LANL saved considerable time and money.

**Quick time to market.** The time it took to market the system was also significantly reduced through LANL's use of existing development platforms.