TABOR ELECTRONICS

Proteus

Advanced Experiment Grade Software Defined Radio

Spectroscopy, and Quantum Device Control

Enabling the Breakthroughs of Tomorrow

Distribution in the UK & Ireland

Lambda

Characterisation, Measurement & Analysis

Lambda Photometrics Limited
Lambda House Batford Mill
Harpenden Herts AL5 5BZ
United Kingdom
E: info@lambdaphoto.co.uk
W: www.lambdaphoto.co.uk
T: +44 (0)1582 764334
F: +44 (0)1582 712084

The Instrument at the center of discovery

Why can standard equipment hold back next-generation physics.

For decades, advanced experimental laboratories have been trapped in a loop of instrument fragmentation. The traditional setup is a patchwork of compromises: an Arbitrary Waveform Generator (AWG) is deployed to stimulate a device under test, a standalone oscilloscope or digitizer is required to capture the response, and an external PC handles the data processing via high-latency communication buses and overall synchronization is provided with a trigger pulse generator. This disjointed architecture introduces propagation delays, synchronization bottlenecks, and severe processing latency.

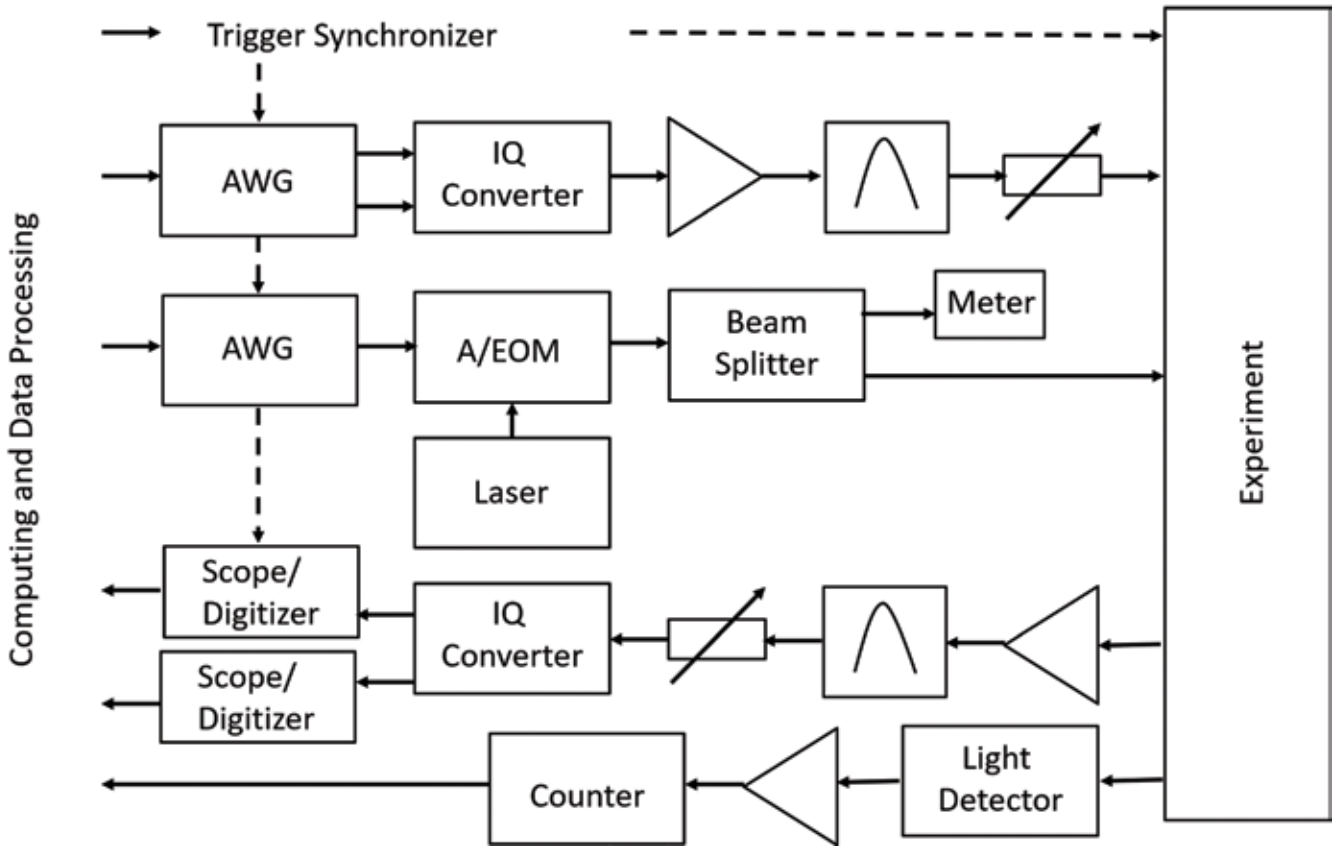

Figure 1 Traditional Experiment Setup

The Proteus Solution: Experiment Grade Software Defined Radio

The Tabor Proteus family redefines the instrumentation landscape. It is not merely a high-performance AWG; it is a fully integrated **Software Defined Transceiver** designed to sit directly at the literal **Center of the Experiment**. By unifying high-speed signal generation, microwave-frequency digitizing, and user-programmable real-time computing within a single hardware ecosystem, Proteus creates a continuous, high-throughput, closed-loop environment.

- **High frequency pulse generation** - RF or fast rise time
- **Pulse scheduling** – Complex pulse sequencies
- **Digitization** - Capture immediate experimental responses via integrated high-speed RF analog-to-digital converters (ADCs).
- **Analysis** - Process data instantly at the hardware edge using an embedded server architecture and local DSP.
- **Control** – Coherent TTL trigger pulses

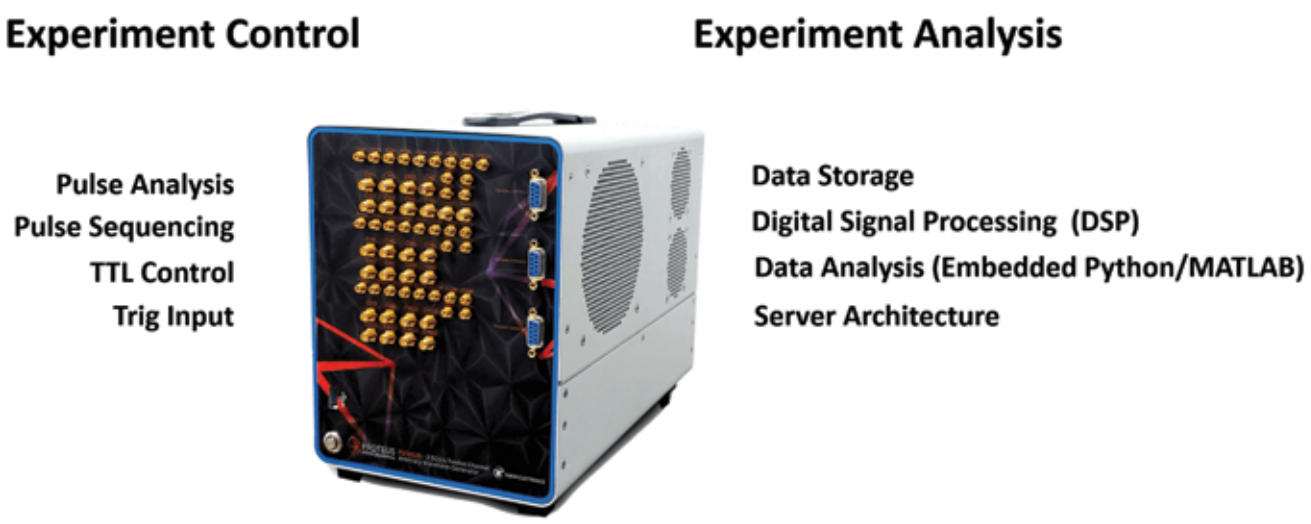

Figure 2: Integrated Experimental Solution

Uncompromising Hardware Convergence

Inside the Proteus Transceiver Block Diagram

As detailed in the Figure 3, the Proteus architecture relies on a ultra-wideband internal bus fabric that eliminates traditional data transfer bottlenecks. Every channel, converter, and memory block is tightly coupled to maximize coherent deterministic generation and analysis.

High-Throughput System Interface

- **PCIe Backplane:** Provides massive data pipes directly into the core system, allowing for rapid waveform streaming and fast data acquisition offloading.
- **Up to 16GS Memory**: An incredibly large dynamic waveform memory that can be shared between generation and analysis, ensures you can store intricate, long-duration pulse sequences alongside raw captured experimental data.

Signal Generation & Acquisition Cores

- **RF DAC & Output**: Delivers highly synchronized, multi-channel direct RF output capable of generating phase-controlled, modulated, and intricately shaped pulses.
- **RF ADC & Input**: Dual-channel high-speed digitizer inputs feed signals directly into the processing engine, enabling immediate loop closure without leaving the instrument chassis.
- **Comprehensive Clocking & Synchronization**: Features dedicated System Clock (**SLCK**) inputs, external **Triggers**, and high-speed **TTL outputs** for deterministic timing across all connected nodes.

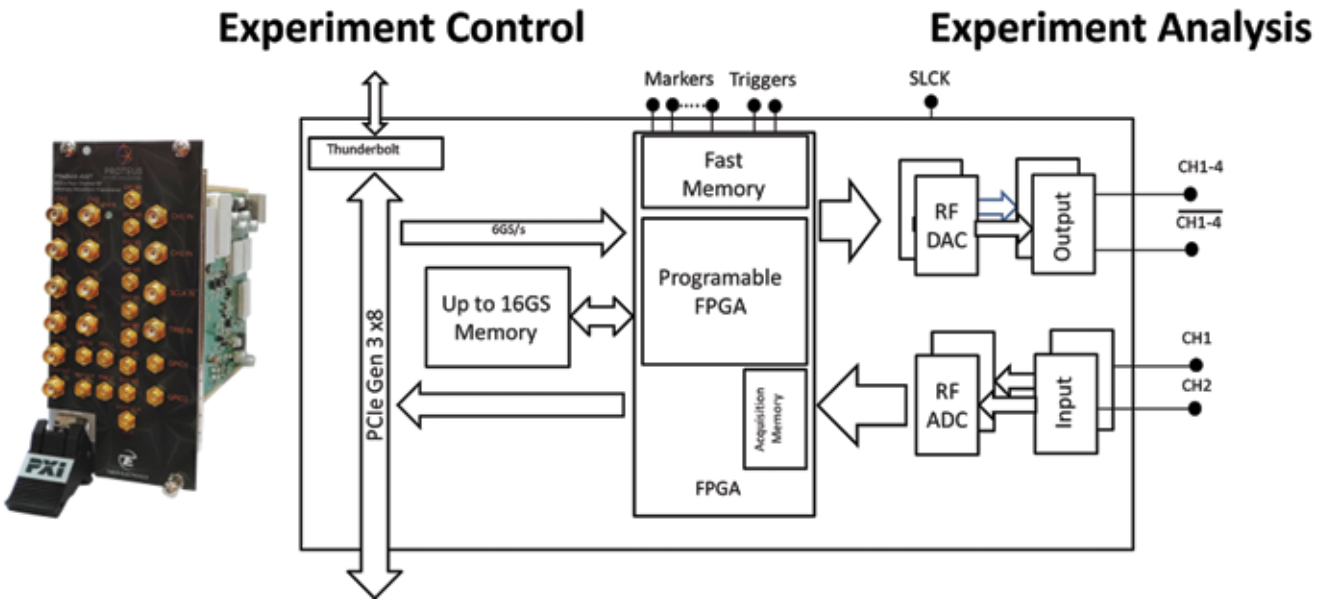

Figure 3: Synchronous Modular Capability

Real-Time Interaction

From Stimulus to Analysis

The true power of placing the Tabor Proteus at the center of an experiment lies in its ability to execute real-time decision-making. Rather than digitizing data and sending it across a slow GPIB or LAN interface to an external computer, the Proteus processes information right where it is captured.

Programmable FPGA & Native DSP

At the heart of the Proteus is a powerful, **Programmable FPGA** that bridges the RF DACs and RF ADCs. This hardware acceleration layer provides instantaneous digital signal processing:

- **Digital Down-Conversion (DDC)**: Shift high-frequency inputs down to baseband natively in hardware, reducing data storage overhead and filtering out unwanted noise.
- **Real-Time FFT**: Transition immediately from the **Time Domain (Oscilloscope)** to the **Frequency Domain (FFT Spectrum)** at hardware speeds.
- **Amplitude & Wave Averaging**: Extract weak signals from extreme environmental noise automatically before passing the data to the user interface.

Embedded Server Architecture

The instrument features an integrated **Server Architecture** that enables advanced software automation directly on the box:

- **Data Analysis via Embedded Python & MATLAB**: Run your custom control loops, optimization algorithms, or calibration scripts natively on the device.
- **Dynamic Pulse Sequencing**: Alter pulse parameters, branching logic, and trigger responses dynamically based on incoming real-time calculations.

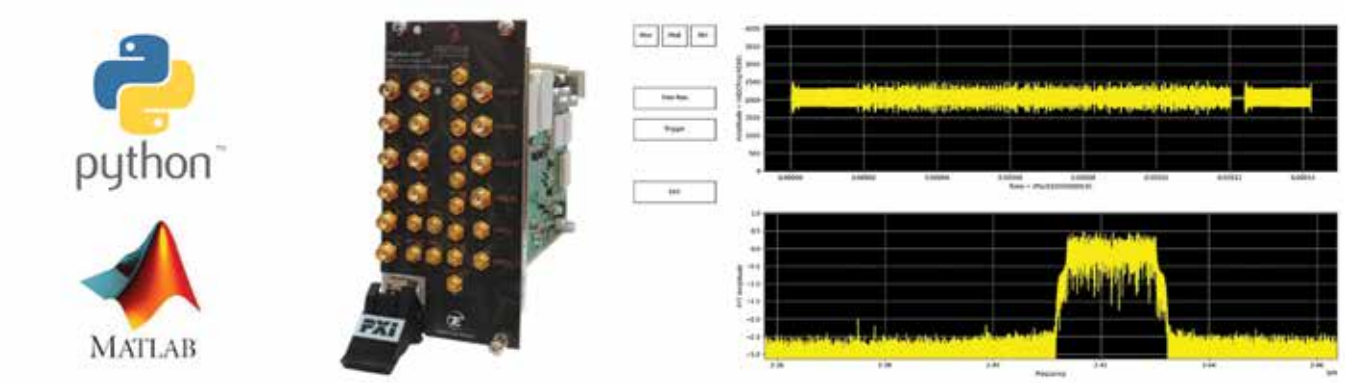

Figure 4: Multiple Instrument Capability

Engineered for the Frontiers of Physics

Reinvigorating research across diverse scientific domains.

The multifunctional nature of the Tabor Proteus replaces multiple racks of legacy equipment in specialized laboratories, enabling streamlined workflows across critical fields.

Quantum Information & Communication

- **Qubit Characterization:** Generate the highly precise, phase-coherent microwave pulses required for state manipulation, and use the integrated digitizer to read out state results with minimal latency.
- **Quantum Key Distribution (QKD)**: Deliver the strict timing synchronization, and fast pulse sequencing

Advanced Resonance & Material Science

- **NMR / EPR Spectroscopy**: Drive nuclear magnetic resonance and electron paramagnetic resonance experiments with repeatable, phase-stable Spin Echo profiles.
- **Active Hardware Interfacing**: Coordinate complex physical tasks—such as **TTL Sample Shuttling** or protecting sensitive preamplifiers via TTL Blanking—directly from the instrument's hardware marker lines.
- **Semiconductor Analysis**: Characterize high-speed transport phenomena and material physics using integrated time-domain and frequency-domain tracking.

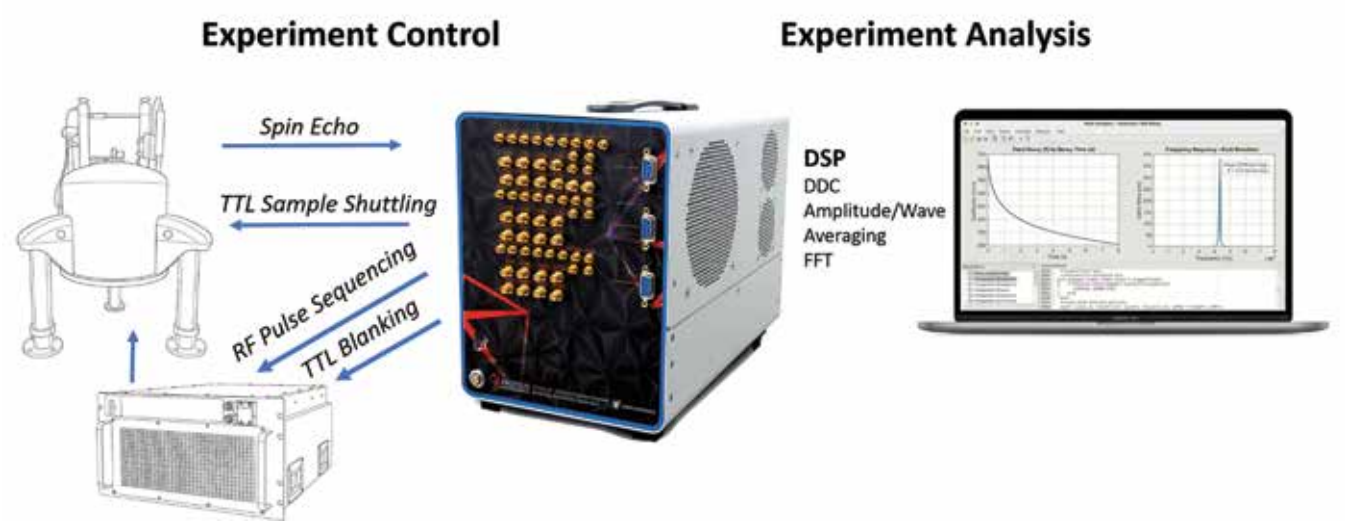

Figure 5: Designed to serve multiple experiments

Future-Proof Scalability, Globally Validated

Form factors that expand alongside your research goals.

No two laboratory configurations are identical. The Proteus platform is entirely modular and scalable, ensuring that your capital investment scales seamlessly from a single-channel benchtop experiment to a massive, multi-rack quantum system.

Figure 6: Multiple Formfactors, plug and play scalable

Trusted by the World's Leading Scientific Institutions

Tabor Electronics is a premier hardware supplier to the global physics community. The "Center of the Experiment" methodology outlined in actively trusted, deployed, and proven across multiple research organizations.

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