The Smart Solution for FPGA Physical Testing!

Oxytronic AVP254 is an automatic physical verification platform for FPGA, especially developed to meet safety-critical FPGA verification objectives, while drastically saving testing costs and delays.

Key Features

- **Physical verification environment base, with associated virtual simulation model**
  - FPGA on board and FPGA virtual verification for all FPGA vendors
  - One single set of procedures for both environments

- **Fully automatic and self-checking testbench**
  - Requirements based log files and associated status
  - Detailed measurements values and code coverage metrics reports

- **Includes standard set of qualified functions**
  - Basic signal acquisition and generation operations
  - Loop management for recurring sequences

- **Easy integration of user defined functions**
  - Client-specific interfaces management capability: ARINC, AFDX, CAN, 1553, PCIe…
  - Third-party models integration

- **Device Under Test power supply management**
  - Customisable power supplies
  - Automatic power management to prevent hardware damages during tests

- **Reusable and based on industry standard**
  - Solution based on NI PXI architecture
  - Generation of ASCII log files for external processing
  - Easy migration to production tests

- **DO254 flow compliance**
  - Many successful certifications for our customers up to DAL A by both FAA and EASA authorities
  - Support up to S01#4

Benefits

- **Accelerate your Time-to-Market and save money**
  - Reuse your RTL simulation patterns for FPGA physical verification without redeveloping test vectors
  - Reuse your generic testbench for the verification of next FPGAs

- **Provide comprehensive test coverage rate on target board**

More Information

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Hardware Architecture

Based on the customer board specification, Oxytronic defines the best hardware solution for the physical verification, including: chassis, modules, cables and specific PCB. Then we develop the testbench setup to provide a ready-to-use automatic solution for the Client.

Virtual Simulation and Physical Verification Equivalence

The board model is only a high-level behavioral model.

* Bitstream Gate-Level from the P&R tool or RTL Code

* Provided by Oxytronic
Power and IOs management

Device Under Test power supply:
- Configurable number of sources
- Configurable voltage range for each source
- Soft controlled to prevent hardware damages

Digital IOs management:
- Sampling frequency up to 200 MHz
- Configurable voltages

Analog IOs management:
- Customisable features: sampling frequency, voltage range and accuracy

Qualified Standard Function Set

**ASSIGN**
Assign a value to a single signal or to a bus

**SET_IO_DIR**
Define the direction of the IO lines

**CHECKOUT**
Check the value of a signal

**CHECKSIG**
Check the period and the duty cycle of a signal

**CHECKTIME**
Check the time between two events

**WAIT_EVENT**
Wait for an event on a signal

**WAIT_TIME**
Wait for a defined time

**LOOP / LOOPx**
Repeat a sequence of instructions

**DISPLAY**
Display a message in the log file

User-defined Function Set

**SET_COM**
Give the configuration and the data to be sent using user defined interfaces

**GET_COM**
Check configuration and data received using user defined interfaces

**CALCULATE**
Call the user defined algorithm models

Implementing Communication Protocols (AFDX, ARINC, CAN, PCIe...)

When the target board implements a communication protocol, the protocol has to be implemented at hardware and software level in the testbench. Oxytronic provides the best optimized solution in terms of cost and performances:

- either by choosing a dedicated PXI module, or a combination of free IOs and HW components on the interface PCB to implement the protocol
- either by writing the communication function using the User-defined function set, or by implementing an existing third-party IP.
- and by providing the qualification report for the function

Implementing external components (DDR, μP, μC, ADC...)

AVP254 is also able to verify requirements implemented in the FPGA through external components on the board like external memories, microcontrollers/processors, ADC...

At the virtual simulation level, Oxytronic will develop a model of each external component. A model does not need to represent all functionalities of the component: it is only a VHDL/C high-level behavioral model.
Comparison between traditional verification and the Oxytronic solution

![Bar chart comparing traditional verification and Oxytronic solution](image)

**Real Facts**

This illustration shows the verification workload for an FPGA that uses a traditional verification methodology (test vectors are written for the simulation, and then re-written for the physical verification) compared to the workload using our automatic testbench.

Results examples are related to a real project developed by Oxytronic with following characteristics:

- FPGA: Microsemi A3PE3000, 83% full
- Nb of I/Os: 123
- DO-254 Level-A

Using a workload basis of 100% with the traditional methodology, we obtain 43% by using our automatic testbench (including all extra-work necessary for the testbench setup). The gain in terms of work weeks is more than 50%. The more complex the FPGA is, the higher are the savings.

Three steps to facilitate your FPGA verification

According to the board specification, Oxytronic provides customer with a ready-to-use testbench to be operated in 3 steps:

1. **Step 1**: Write the unique set of test procedures
2. **Step 2**: Execution with simulation tool
3. **Step 3**: Get and analyze results

**Oxytronic Product Package and Services**

Our offering includes:

- The full PXI testbench with associated calibration reports, documentation and software including: test sequencer, auto-verification engine, report generation engine and GUI,
- The testbench simulation model,
- A DO-254 qualification report for all native functions,
- A testing PC,
- The design of the specific hardware interface board,
- A training for methodology understanding and platform handling,
- Additional services for the development of your verification functions: custom interfaces development and integration, DO-254 qualification report for all custom functions with associated reviews.