

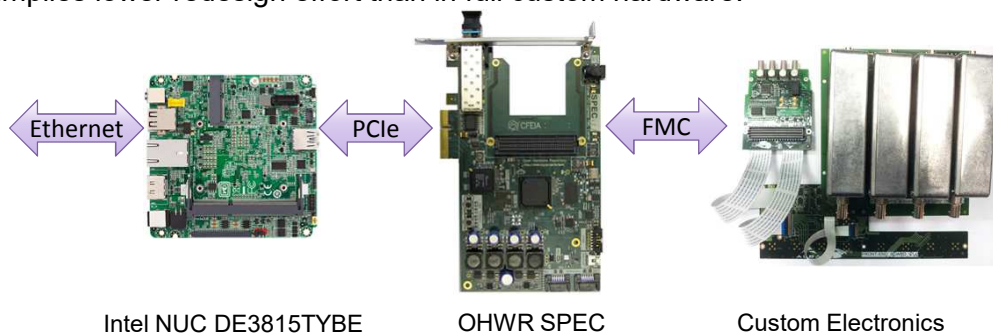
# Em# Platform: towards a hardware interface standardization scheme

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Em# is the 4-channel electrometer evolution of the in-house developed ALBA Em which has been widely used at ALBA from 2011. In 2013 a redesign of the equipment raised from the increase of needs in new experimental applications. The new approach to the project is based on hardware interface standardization allowing a more efficient parallel tasking and an easier involvement of different development groups. The new instrument is designed for being capable of independent channel trigger, FPGA based real time processing, feedback implementation via its four analog DACs in the kHz's range or acquisition under 1kV ground bias voltage.

## NEW HARDWARE APPROACH: DO NOT SELECT THE COMPONENTS, SELECT THE INTERFACES

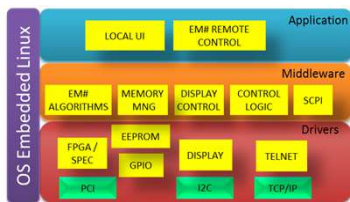
Based on the selection of expected long-life interfaces for communication between modules. Then, modules are selected to fulfil the interface and specification requirements. In case of module obsolescence, its replacement implies lower redesign effort than in full custom hardware.



## EM# 4-CHANNEL ELECTROMETER SPECIFICATIONS

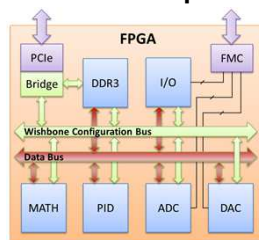
Current Amplifier	Eight independent ranges (from 100pA to 1mA) and five 2 <sup>nd</sup> order analog filters (from 0.1Hz to full bandwidth)
ADC	4x 400kS/s @18 bits SAR
Ground Voltage Bias	Up to 1kV
Analog Outputs	4x ±10V 100k/s @16 bits
Trigger In	1 x CMOS/TTL compatible
High-Speed I/O	4x configurable Input/Output 100MHz BW (can be used as independent channel triggers)
General I/O	9x Input/Output @5V 20MHz (unipol/diff) + 4x 5V output max 500mA

## Integrated Control System



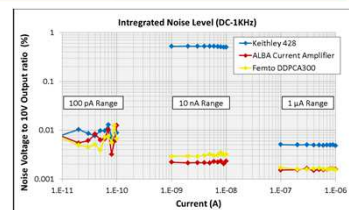
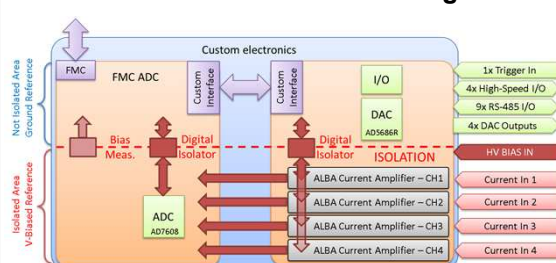
- OS Embedded Linux
- Management of communication protocol (remote control)
- Implementation of high-level equipment functionality
- Efficient Driver installation
- Control System Integration considering whole architecture

## Flexible Dual Bus Implementation



- SDB standard implementation
- Wishbone Bus for configuration
- Data Bus for high speed transfer
- Flexible Data Processing. Higher-grade applications possibility: Feedback, Close Loop
- Big fast storage capacity: 32MS

## Current Measurement with Voltage Bias



- ALBA Current Amplifier excellent performance
- OHWR FMC with isolated 4ch 18b 400kS/s ADC withstanding up to 1kV isolation
- Digital I/O and Analog Output availability for advanced applications: Feedback, Close Loop

## Status of the project

- Working Prototype with basic functionality and improved resolution
- Project in the final stage of HW design

## Next Steps

- First working series planned to be produced on January 2016
- Development focused on software and firmware



Development Collaboration Agreement has been signed between ALBA and MAXIV to foster project development. The inclusion of other institutes is open and welcome.

