The CERN OHL is also used for non-CERN designs.

Companies may produce, sell and support the open designs like products of their own. Peer reviews are actively sought for to improve the designs and to make them better re-usable. Three out of four module types are custom designed; one in four is commercial.

Open Hardware can be produced and supported by any company, removing this burden from CERN.

Standards for New Designs

To ease design work, maintenance and to guarantee longevity, new designs are based on standards.

**External bus standards**

- VME64x
  - Boards with 6U height and large front-panel space
  - Possibility of using Rear-Transition Modules
- PCI Express
  - Used in PICMG 1.3 industrial type PC
- FMC Mezzanine bus standard
  - FPGA Mezzanine Card (FMC) Standard (ANSI VITA 57.1)
    - Mezzanine Carrier approach: Approx. 48 mm by 84 mm mezzanine size
    - Allows designing functionality once on a mezzanine so that it can be re-used on several carriers
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**FMC ADC 100M 14b 4ch – ADC (produced by industry)**

- FMC ADC 100M 14b 4ch – ADC (produced by industry)
  - Four channel Analog to Digital converter
  - Two LPC (Low Pin Count) FMC slots
  - Two Spartan6 FPGA using Wishbone cores
  - Two PLLs for clock cleaning and redistributing clocks
  - On-board memory: two 72MBit 8Bit SRAMS, 2GBit DDR3
  - Two Small Formfactor Pluggable (SFP) connectors
  - Two Spartan6 FPGA
  - XC6SLX45T using Wishbone cores
  - Four channel output fine delay module

**Examples of other designs in OHR**

- Examples of other designs in OHR
  - nanoFIP: WorldFIP Industrial fieldbus interface chip
  - Time-to-Digital Converter FMC with better than 1 ns resolution
  - White Rabbit timing network switch and firmware
  - ARM-based computer running Linux
  - TTL to NM level converter in VME64x
  - Reconfigurable interface for computing and radio (University of Cape Town, South-Africa)
  - Trigger/Timing Logic Unit (Bristol University, UK)

**Examples of IP cores using Wishbone in OHR**

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  - VME64x core
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**Open Hardware Repository & CERN Open Hardware Licence**

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**Overview of BE-CO Controls Hardware**

- The Controls Group of the Beam Department (BE-CO) at CERN is responsible for the specification, design, procurement, integration, installation, commissioning and operation of the controls infrastructure for all accelerators, their transfer lines and the experimental areas.
- The group provides services like general machine and beam synchronous timing generation and distribution and signal observation systems, as well as support for drivers and higher-level software.
- As example, Quench Protection, Cryogenics, Power Converters and other critical systems use BE-CO’s kits. The screens in the CERN Control Centre are generated using BE-CO’s hardware and software.

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