

### Design overview

The Neutron Detector Module (NDM v1.0) allows the read-out and processing of a maximum of 16 channels of detection for any type of Detector Head based on ZnS(Ag)-<sup>6</sup>Li scintillator technology.

- Optimized for the use with photomultipliers (PMTs).
- Compatible with SiPMs
- 16x input channels / 16x 5V outputs
- 4 configurable monitoring ports.
- External clock input for time stamp processing.
- 1x I2C port.

Includes a GUI software in java that works as master controller and data managing interface.



### Functional highlights

- Fully digital system based on FPGA technology
- All internal parameters can be modified by the user.
- Stand alone operation (before initial configuration)
- Online statistical analysis.
- Event record mode at both pixel and PMT level.
- Custom processing implementations are possible upon demand.
- User friendly interface with full access to internal parameter.

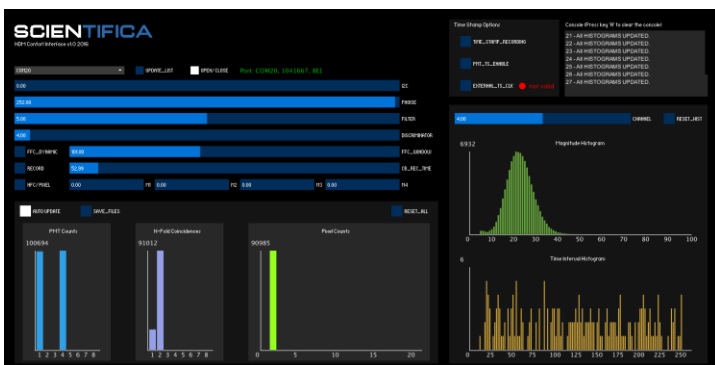
### Applications

- Electronics read-out of any neutron detector based on ZnS(Ag)-<sup>6</sup>Li scintillator.
- Testing platform for novel concepts of neutron detectors.

### References

NDM v1.0 is being used in:

- ESS Bilbao NDH CF/W



### Specification

- 16x processing channels
- 5x configurable monitor outputs
- 1x I2C bus interface
- 16x 5VDC outputs (25W)
- 185 x 250 mm 1U enrackable case
- Artix 7 (XC7A100T) FPGA.
- USB communication interface.
- 7 GPIO ports at rear
- Time Stamp Recording modes
  - PMT events / Pixel events
  - Internal/External clock
- Processing Block included:
  - Dark pulses Filter
  - Discriminator Window
  - Discriminator Level
  - Coincidence Decoder
  - Pixel Calculation
- Statistical Analysis:
  - Counts per PMT
  - Coincidence statistics
  - Counts per Pixel
  - \*Number of 'single photon' per event
  - \*Time between events histogram
  - Recording Time Modes: Countdown / Continuous

\*This analysis is made for just 1 channel eligible by the user for each run

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