

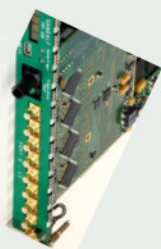
GANDALF - a Modular Electronic Readout System for High Energy Physics

G. Ahluwalia¹, J. Barth¹, S. Bartknecht², J. Bieling¹, M. Büchele², H. Fischer², F. Herrmann², F. Klein¹, K. Königsmann², L. Lauser², J. Pretz¹, C. Schill², S. Schopferer², H. Wollny²

¹Universität Bonn, Physikalisches Institut, 53115 Bonn, Germany

²Universität Freiburg, Physikalisches Institut, 79104 Freiburg, Germany

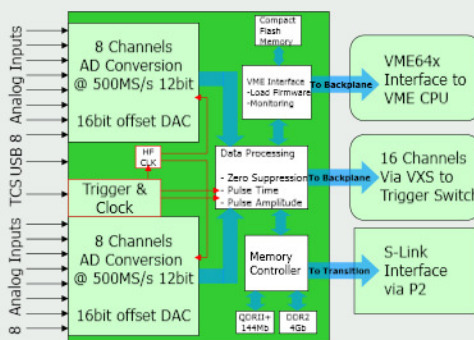
Analog Input



- Single ended DC-coupled inputs
- Input impedance 50 Ω
- Dynamic range -4V
- Bandwidth 500MHz
- 1 \pm 1V programmable Baseline offset with 16 bit DAC



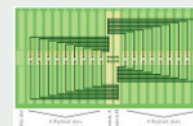
The GANDALF Readout System



Backplane I/O

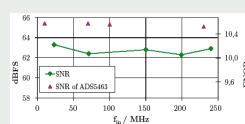
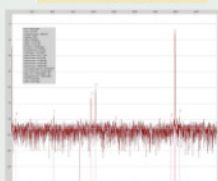
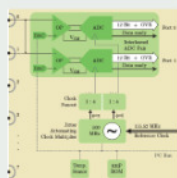


- VME64x
 - Firmware
 - Monitoring
- VXS
 - 16 high speed connections to trigger electronics
- Data I/O optional via
 - S-Link
 - Ethernet
 - VME64x (640 Mbit/s block r/w)
 - USB 2.0



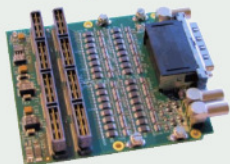
ADC Mezzanine Card

- 12 bit digitization
- 8 channels 1 GS/s (interleaved)
- 16 channels 500 MS/s



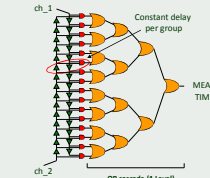
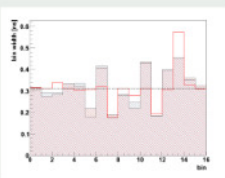
Digitization error as function of analog input frequency

Digital Mezzanine Card



- 128 LVDS channels as input or output
- 2 NIM out, 1 NIM in
- User applications programmable inside FPGA, i.e. TDC, Scaler, Mean Timer, Decision Logic

HD-CI

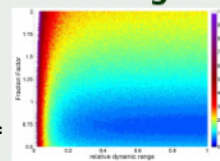


- The GANDALF Readout System – a versatile and highly cost efficient digitization tool for nuclear, particle and atomic physics experiments

- System applications as:
 - self-triggered high-resolution sampling ADC
 - 128 ch TDC (100ps)
 - 128 ch Scaler (250 MHz)
 - 128 ch Mean Timer & Decision Logic

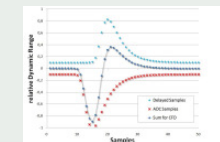
Data Processing

Time resolution as function of pulse amplitude and constant fraction:



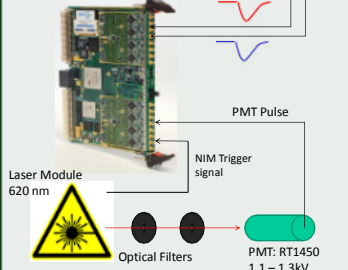
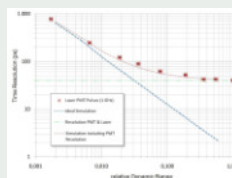
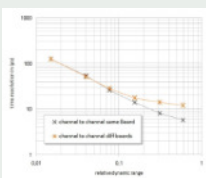
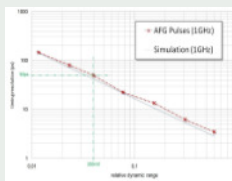
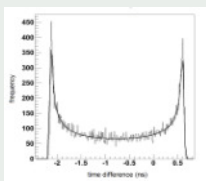
- Online zero suppression
- Pulse shape analysis
 - Pulse time
 - Pulse amplitude
 - Pile-up double pulses

digital Constant Fraction Algorithm



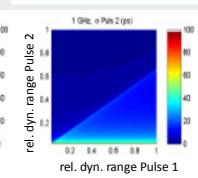
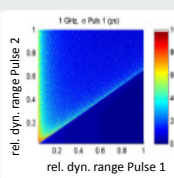
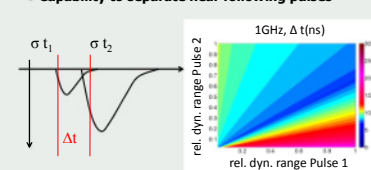
Measurement 1: Time Resolution Measurements

Signal generation: Arbitrary Function Generator



Double Pulse Resolution

- Capability to separate near following pulses



Funding:



Contact: Florian Herrmann

florian.herrmann@cern.ch
+49761 203 5877

http://hadron.physik.uni-freiburg.de/gandalf