UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Digital signal processing for nuclear physics

2122-86R-DigSignal

Title

Digital signal processing for nuclear physics

Teacher(s)

Dott. Andrea Abba

Language

English

Short description

1. Application of digital signal processing in nuclear physics

2. Particle detectors and analog front-end

3. Signal digitalization

4. Measuring position of interaction, energy and time of arrival

5. Energy measurement:

   Digital Pulse Shape Analysis

Trigger Circuit
Baseline drift compensation
Digital Filter Synthesis
Pileup rejection
Spectrum Calculation

6. High resolution time of arrival measurement
TAC - time to amplitude converters
TDC - time to digital converters
Applications in high energy/neutron physics

7. Spatial detectors
Position sense detectors (gamma camera/He3 position sense tube)
energy and position of interaction reconstruction
Pixelated detectors. SiPM MPPC detectors
ASIC to readout pixelated detectors.

Usage of a Citiroc ASIC on DT5550W to reconstruct SiPM image of a laser spot

8. Custom firmware development with SciCompiler and detector emulator
Design of digital logic for trigger
Waveform digitalization
Digital charge integration
Trapezoidal filter
Using of time correlation to isolate Na22 (emulated) source from the background
Implementation of a 500ps resolution TDC

CFU / Hours

12 hours

Teaching period

January- March