PyMoDAQ-Femto
Modular Data Acquisition with Python
For Femtosecond pulse characterization
Sébastien Weber
What for?

Acquisition of spectra as a function of the delay

Typical FROG Setup

PyMoDAQ-Femto

Simulations and reconstructions
Based on open Source python codes!

PyMoDAQ
Modular Data Acquisition with Python

PyMoDAQ, Modular Data Acquisition with Python, is a set of python modules used to interface any kind of experiments. It simplifies the interaction with detector and actuator hardware to go straight to the data acquisition of interest.

http://pymodaq.cnrs.fr
PyMoDAQ Review of scientific Instrument (Submitted)

https://pypret.readthedocs.io

Python for Pulse Retrieval

This project aims to provide numerical algorithms for ultrashort laser pulse measurement methods such as frequency resolved optical gating (FROG), dispersion scan (d-scan), or time-domain phcthography (TDP) and more. Specifically, provides a reference implementation of the algorithms presented in our paper “Common pulse retrieval algorithm: a fast and universal method to retrieve ultrashort pulses.”
Complete interface for:

1) Simulation
Complete interface for:

2) Acquisition

PyMoDAQ’s Dashboard and its control modules

PyMoDAQ’s extension: DaqScan
Complete interface for:
3) Pulse Shape Retrieval
Complete interface:

4) With fine exportable graphs
Who did what?

Nils C. Geib
Friedrich Schiller University Jena | FSU · Abbe Center of Photonics (ACP)
Developped the PyPret package for Non-linear Trace reconstruction

Sébastien J Weber
Centre d'Élaboration de Matériaux et d'Etudes Structurales
Research Engineer at CEMES-CNRS Toulouse
Developped PyMoDAQ and the interface on Pypret

Romain Géneaux
Atomic Energy and Alternative Energies Commission | CEA · Laboratory Interactions, Dynamics and Lasers
PhD
Beta-testing and initial impulse on PyMoDAQ-Femto
I want to measure data as a function of varying parameters!

**Detectors**
- Camera
- Analog signals
- Spectrum
- ...

**Actuators**
- Linear stage
- Rotation
- Temperature controller
- Current
- Voltage
- ...

- Camera
- 2 galva mirrors
- Translation stage
- Laser wavelength
- XY stage
- Spectrometer
- Photomultiplicator

Need for a modular Interface
PyMoDAQ’s Overview

Control Modules

PID Controller
DAQ Move
Actuator
M...

Dashboard

DAQ Viewer
Detector
N...

Custom Extension

Extension Modules

DAQ Logger
Data logging

DAQ Scan
0D, 1D, 2D, ND data acquisition

Remote Manager
Ctrl+X

Online Data Browsing

H5Browser
Control Modules

DAQ Move: Actuators set/get values

![Diagram of DAQ Move controls](image-url)
Control modules

DAQ Viewer: Grab data from detectors (0D, 1D or 2D)
Dashboard example

Demonstration
... and its extensions
PyMoDAQ extensions: Scanner

Démonstration
Scan Examples on the Ultrafast Electron Microscope: FemtoTEM

- Probe current (Pico-amperemeter) as a function of laser pulse displacement, axes XY mirror M2
- Probe current (Pico-amperemeter) as a function of laser polarisation (HWP2)
- Probe current (Pico-amperemeter) as a function of laser intensity (HWP1)
- Probe current (Pico-amperemeter) as a function of pump probe delay femtosecond
Stay in touch and contribute

https://github.com/CEMES-CNRS/PyMoDAQ

http://pymodaq.cnrs.fr/
PyMoDAQ-Femto: 1) Simulation
PyMoDAQ-Femto: 2) Acquisition
PyMoDAQ Femto: 3) ReTrieval