ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Supervisory Control and Data Acquisition system of the n2EDM experiment

Master's Thesis

Konstantin Nesterov

Friday 15th November, 2019

Advisors: Prof. Dr. K. S. Kirch, Dr. Jochen Krempel
Department of Physics, ETH Zürich

Abstract

Just as nowadays no serious experiment can be built and conducted by a single person, the experiment itself cannot consist of a single tool. The n2EDM experiment aims to achieve an ambitious goal: to measure the electric dipole moment with a new level of precision. Such challenging project demands the need for the complex and well-connected system. This thesis intends to describe the development of new and improvement of existing components, such as:

- **COM handler** — an adapter translating the POSIX pipes to the TCP/IP connections. Every node in the system is connected with others through it.
- **Sequencer** — a software node orchestrating other nodes. It follows the user-generated script allowing one to describe the reproducible behaviour of the whole DAQ system with a human-readable set of commands.
- **Proxy for the remote magnetometers** — a smart bridge between the pool of the remote magnetometers and a standard TCP/IP interface of the COM handler.
- **Surrounding field compensation system** — a system for active stabilisation of the magnetic field. It uses the data collected by the remote magnetometers and a set of controlled coils to minimise the fluctuations of the magnetic field in the area of the experiment. Better description when I start working on it.

These pieces are essential for the n2EDM experiment to function, so the aim was to make them error-resistant, extendable and easy to support for the future developers.

Contents

Bibliography

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Declaration of originality

The signed declaration of originality is a component of every semester paper, Bachelor's thesis, Master's thesis and any other degree paper undertaken during the course of studies, including the respective electronic versions.

Lecturers may also require a declaration of originality for other written papers compiled for their courses.

I hereby confirm that I am the sole author of the written work here enclosed and that I have compiled it in my own words. Parts excepted are corrections of form and content by the supervisor.

Title of work (in block letters):

Authored by (in block letters):
For papers written by groups the names of all authors are required.

Name(s):	**First name(s):**

With my signature I confirm that

- I have committed none of the forms of plagiarism described in the 'Citation etiquette' information sheet.
- I have documented all methods, data and processes truthfully.
- I have not manipulated any data.
- I have mentioned all persons who were significant facilitators of the work.

I am aware that the work may be screened electronically for plagiarism.

Place, date	**Signature(s)**

For papers written by groups the names of all authors are required. Their signatures collectively guarantee the entire content of the written paper.