



# Thorlabs motion control

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2025.06.30

# Introduction

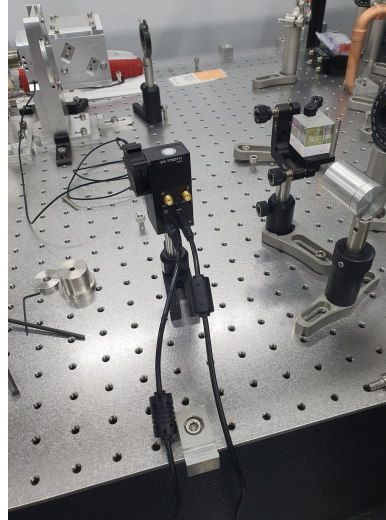


- The quantum squeezing subsystem uses devices created by Thorlabs:

Actuators



Flippers



Translators



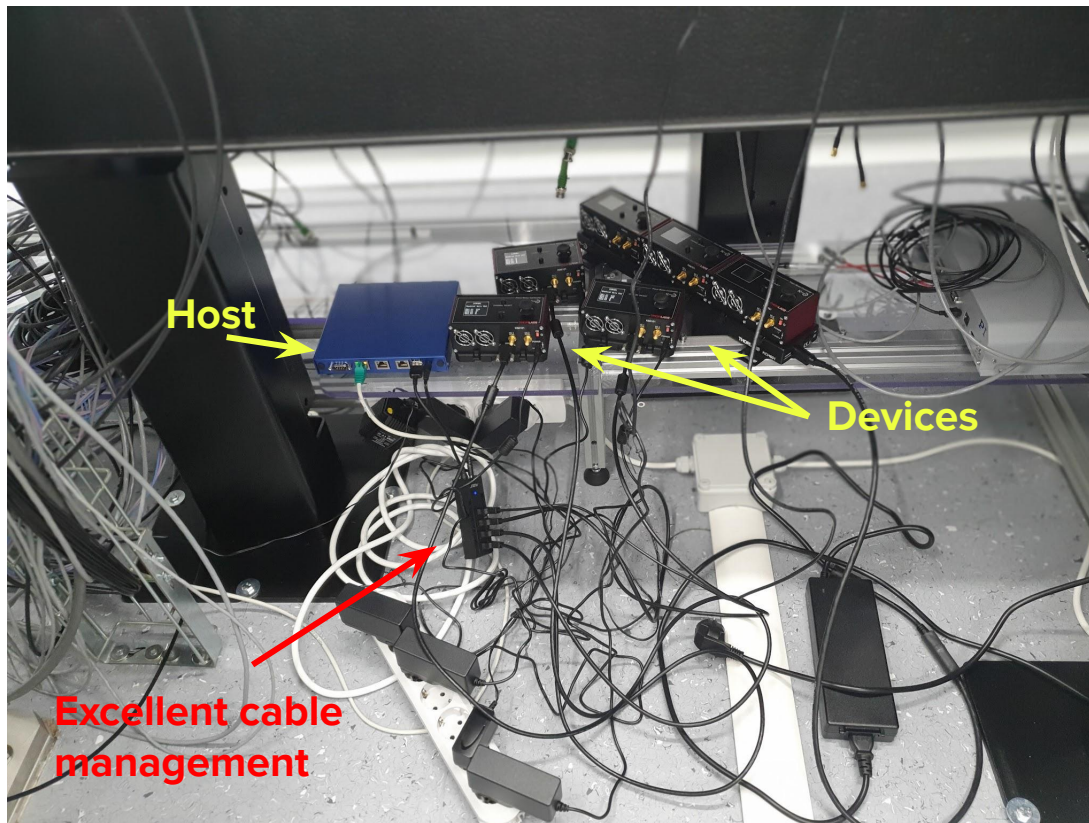
## Project objective

Incorporate the above devices into Virgo's infrastructure



- Project requirements
  - No physical access to the hardware → Network access
  - Automation → Scriptability
  - Continuous operation for years → No memory leaks or similar issues allowed
- Thorlabs provides a graphical interface for controlling devices connected to a computer through USB.
  - Very limited and obviously not suitable for Virgo.
- However, a full [communication protocol](#) is also provided!
  - Defines custom messages that can be exchanged between a Thorlabs device and a host.
  - LabVIEW & MATLAB implementations are also provided by Thorlabs.

# Hardware setup



All devices are connected through USB to the host PC running Linux. All access to the devices happens through the host.



- [LibAPT](#) is a C++17 framework for communicating with Thorlabs devices using the APT communication protocol.
- APT defines various messages that can be exchanged between devices, e.g. for MFF101
  - `HW_REQ_INFO`: Get device info (SN, Name, Type, etc)
  - `MOT_MOVE_JOG`: Move the flipper from one position to the other
  - `MOT_REQ_STATUSBITS`: Request status of the device (e.g. current position)
  - `MOT_GET_STATUSBITS`: Response to above request
- A command line interface through telnet allows remote access to the devices
  - Uses an external library for connection handling.
  - Allows adding and removing devices if the hardware configuration changes.
  - Predefined commands can be used for common operations (e.g. `getPosition` returns flipper's position).
  - Actions can be logged to a file.
- A pexpect script handles exchange of messages directly through the command line and can be used for automating tasks.

# Conclusions



- The system has been operating continuously for multiple years without known issues.
  - Whether this is due to code quality or infrequent use is unknown.
- Only problem face was a hardware failure during Christmas of 2023.
- Support for other devices is easy to add, if need arises.

Thanks!

