Preparation Raspberry Pi4 as controller for CALLISTO

Open: https://www.raspberrypi.org/software/

Download: [https://downloads.raspberrypi.org/imager/imager\_latest.exe](https://downloads.raspberrypi.org/imager/imager_latest.exe%20) and install it on PC  
Follow the instructions of imager\_1.6.1.exe (or newer version)  
For SD card 8GB is sufficient, a larger one will allow to save more data. Recommend 32 GB.

Put SD card into Raspberry Pi 4, connect keyboard, mouse and monitor and finally power. Also connect the USB/RS-232 adapter (Profilic like, no FDTDI chip) which is used to talk to CALLISTO.

Confirm time-zone (need UTC), language, password...   
Then configure network or WiFi such that tools can be downloaded and time synchronized by NTP.

Check if USB/RS-232 adapter is working by:  
dmesg | grep tty   
Expect something like: ttyUSB0   
it is later used in the configuration of CALLISTO -> /etc/callisto/callisto.cfg

For manual communication we need PUTTY  
sudo apt install putty  
Connect terminal 2 and 3 of the RS-232 connector, start PUTTY as serial interface and send a few characters. You should see them coming back as echo.

Install FITS-library from NASA: sudo apt install libcfitsio7

Download callisto software from ETH-server:  
wget <http://sid.ethz.ch/debian/callisto/callisto_1.1.0-2_armhf.deb>

Install package: sudo dpkg -i callisto\_1.1.0-2\_armhf.deb

Check installation: dpkg -L callisto

Need to set up some folders and their permissions:  
1. cd /etc sudo mkdir callisto chown pi callisto chmod 775 callisto  
2. cd /var sudo mkdir www chown pi www chmod 775 www  
3. cd www sudo mkdir callisto chown pi callisto chmod 775 callisto  
4. sudo mkdir backup chown pi backup chmod 775 backup

Prepare configuration files in:  
cd /usr/share/doc/callisto/examples  
Unpack frequency file (just an example for testing): sudo gunzip fr\*

Copy configuration files to the configuration folder:  
cp \*.\* /etc/callisto

Edit configuration file callisto.cfg using nano -> nano callisto.cfg  
Edit communication port, instrument descriptions, geographical information etc.  
Check and edit observation program as:  
nano scheduler.cfg

In case the system is not yet running in UTC, change time:  
timedatectl set-timezone UTC  
Check it with: timedatectl

Now connect a CALLISTO frequency agile spectrometer to the serial port and execute software by:  
callisto

You should see some commands on the monitor and automatic checking of scheduler file  
In case you want to see more start with callisto -D (this is for debug). For more details, see manual in folder /home/pi/callisto/Callistomanual.txt

Remote access via SSH  
sudo apt-get update  
sudo apt install openssh-server  
sudo systemctl status ssh  
In case ssh is not active, change the system configuration by:  
sudo raspi-config and goto interface SSH and enable SSH

Remember DHCP IP address by entering ip a you get something like 192.168.0.245  
Use this IP to configure your PUTTY or WinScp on your PC, such that you can communicate via your network. Once operational, you do not need keyboard, mouse and monitor on Raspberry Pi. Everything can be controlled remotely.

To stop callisto, just send ctrl-c or sudo pkill -9 callisto  
In case the USB/RS-232 adapter or the corresponding driver is blocked for some reason do:  
sudo fuser /dev/ttyUSB0 and you get the PID  
sudo kill -9 PID  
If that doesn't help unplug the adapter and plug it back or reboot the system by:  
sudo reboot

Once you get data in folder /var/www/callisto  
Files with extension .fit and/or .prn, you may copy them to your PC using WinScp.  
\*.fit can be viewed either Java Viewer from here:   
<http://www.e-callisto.org/Software/jv_20070109.jar>

or using Fits Viewer fv.exe from NASA here: [https://heasarc.gsfc.nasa.gov/docs/software/ftools/fv/](https://heasarc.gsfc.nasa.gov/docs/software/ftools/fv/%20)

Spectral overview files OVS\*.prn can be viewed at PC-level with a special tool GenFrqPrg.exe from here:  
<http://www.e-callisto.org/Software/GenFrqPrg.zip>

This tool can then be used to generate a new frequency file, based on an existing spectral overview OVS\*.prn

Figures and plots can be viewed on LINUX with: gpicview

Checking memory space: df -h

For generating new frequency files, based on spectral overviews (OVS\*.prn), scheduler files (scheduler.cfg) read the Callisto software setup manual on the e-callisto web-site here:  
<http://www.e-callisto.org/Software/CALLISTOSoftwareSetup.pdf>