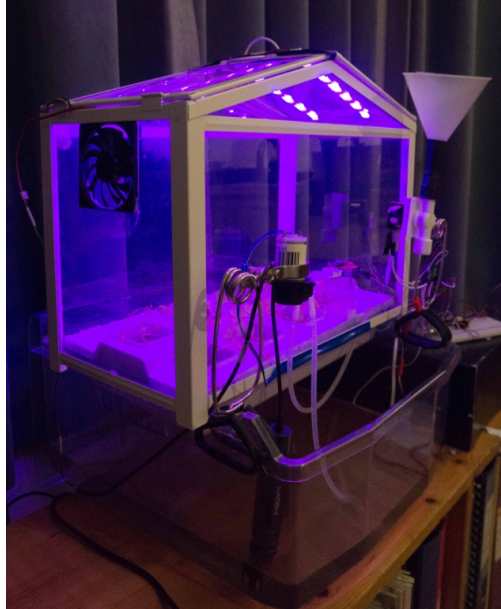# 10 - Results and Calculations

The physical system

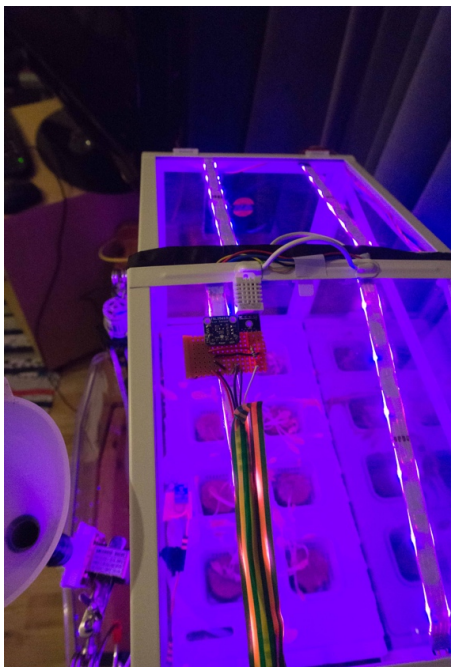*Figure 10.1 - Picture of the greenhouse built, showing the fan, pump and pH meter*

Figure 10.3 - Picture of the greenhouse built, showing the external DHT22 temperature and humidity sensor and the TSL2561 luminosity sensor
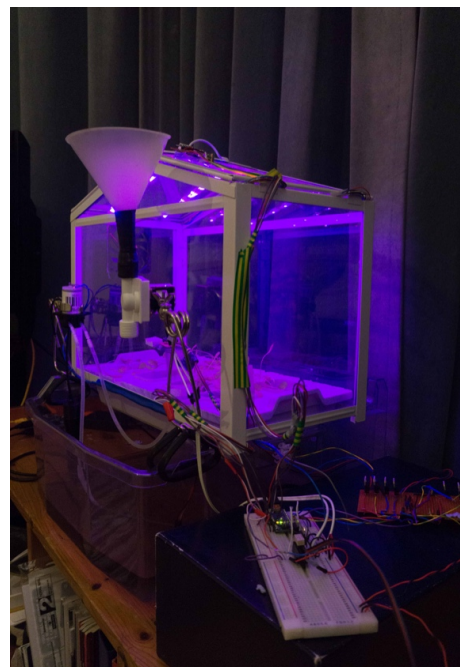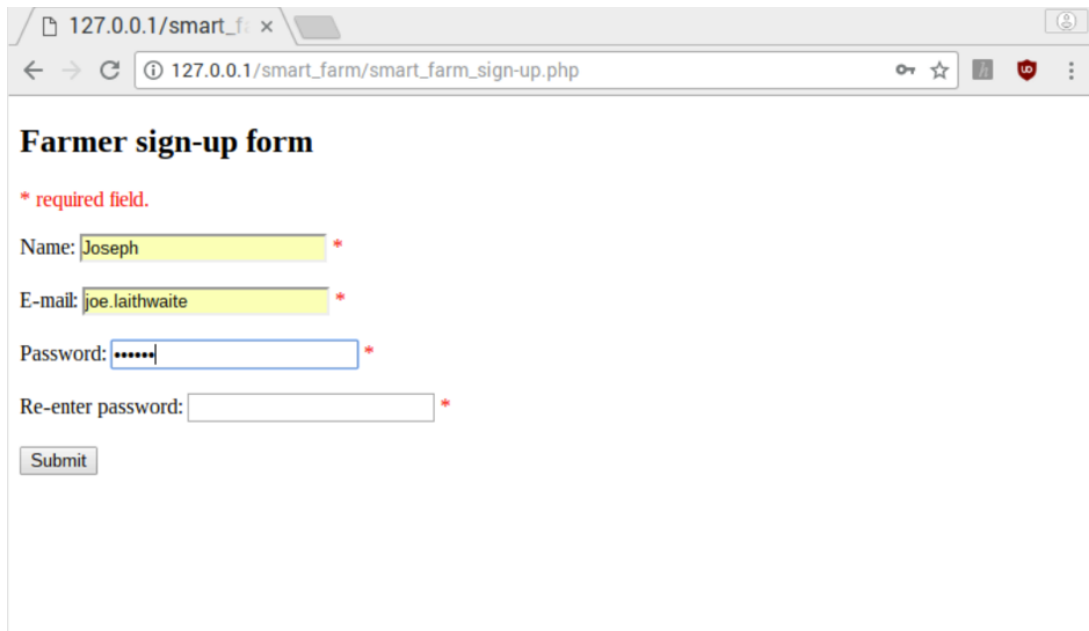

Figure 10.2 - Picture of the greenhouse built, showing the Arduino, Solenoid valve and light control circuitry
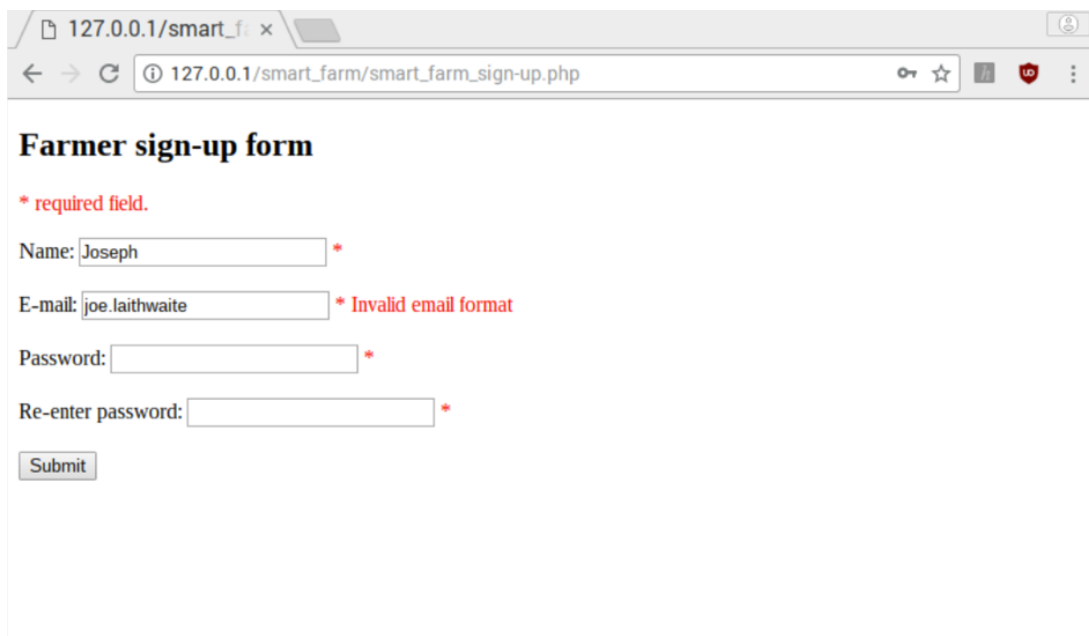
The systems user interface

Figure 10.4 - Screenshot of the sign-up page of the user interface with an invalid email address being tried

Figure 10.5 - Screenshot of the sign-up page of the user interface showing an error message after an ncorrcetly entered email

Farmer sign-up form

* required field.

Name: [Joseph] *

E-mail: [joe.laith@live.com] *

Password: [   ] * Password is required

Re-enter password: [   ] * Password is required

[Submit]

Figure 10.6 - Screenshot of the sign-up page of the user interface showing error messgaes when no passwords are submitted

Login

Farmer sign-in form

* required field.

E-mail: [joe.laith@live.com] *

Password: [••••••••] *

[Sign-in]

[sign-up]

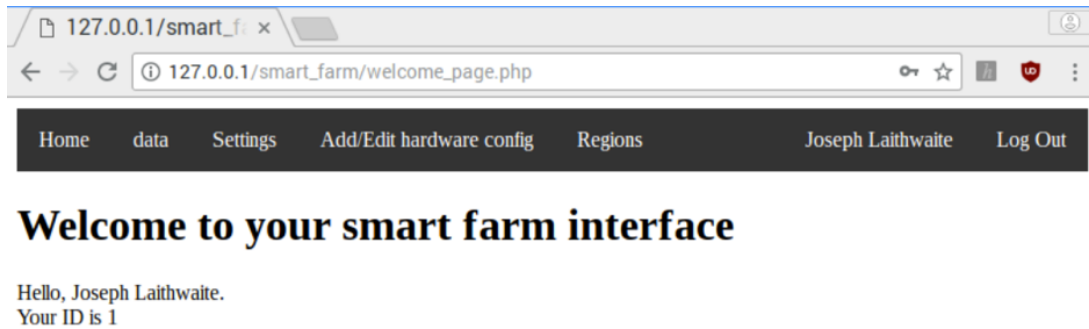*Figure 10.7- Login screen of the user interface with a valid email and password*

Figure 10.8 - Welcome screen of the user interface after successfully signing up or logging in
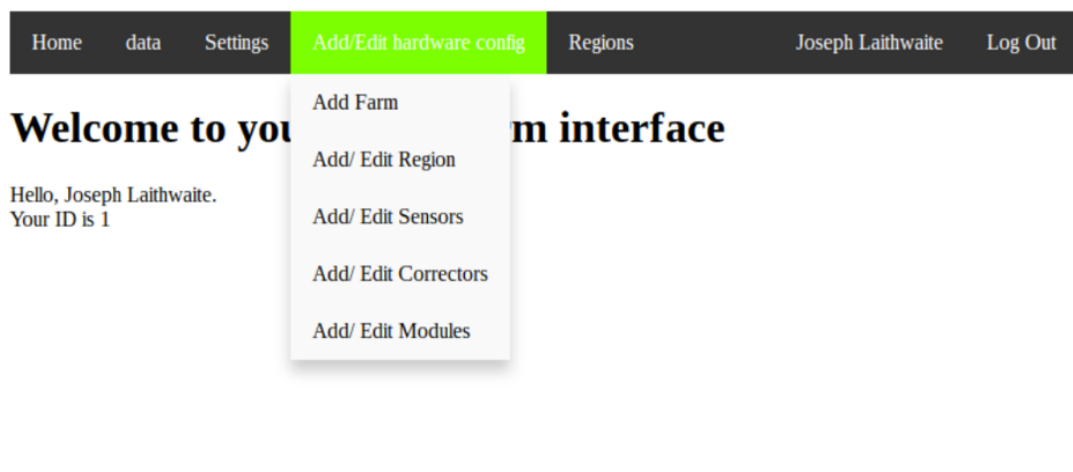
Figure 10.9 - Screenhot of user interface showing Add/ edit hardware menu options

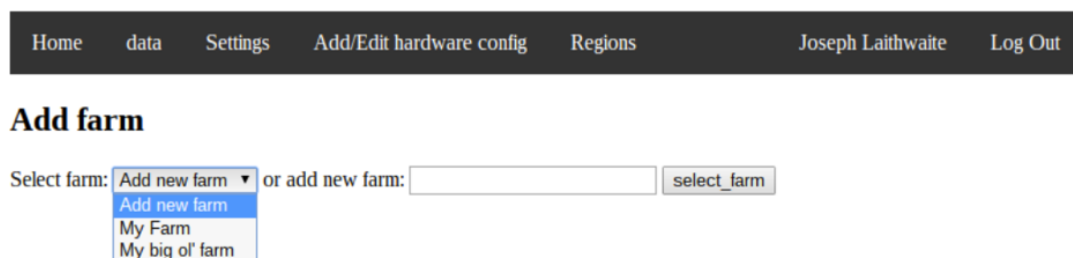*Figure 10.10 - Screenshot of user interface showing options to add or select a farm to edit, it's hardware*

Figure 10.11 - Screenshot of the user interface showing the ability to select or add a new region with the options to edit sensor or correctors

User interface data output

Figure 10.12 - Screenshot of the user interface showing the menu options of data to look at
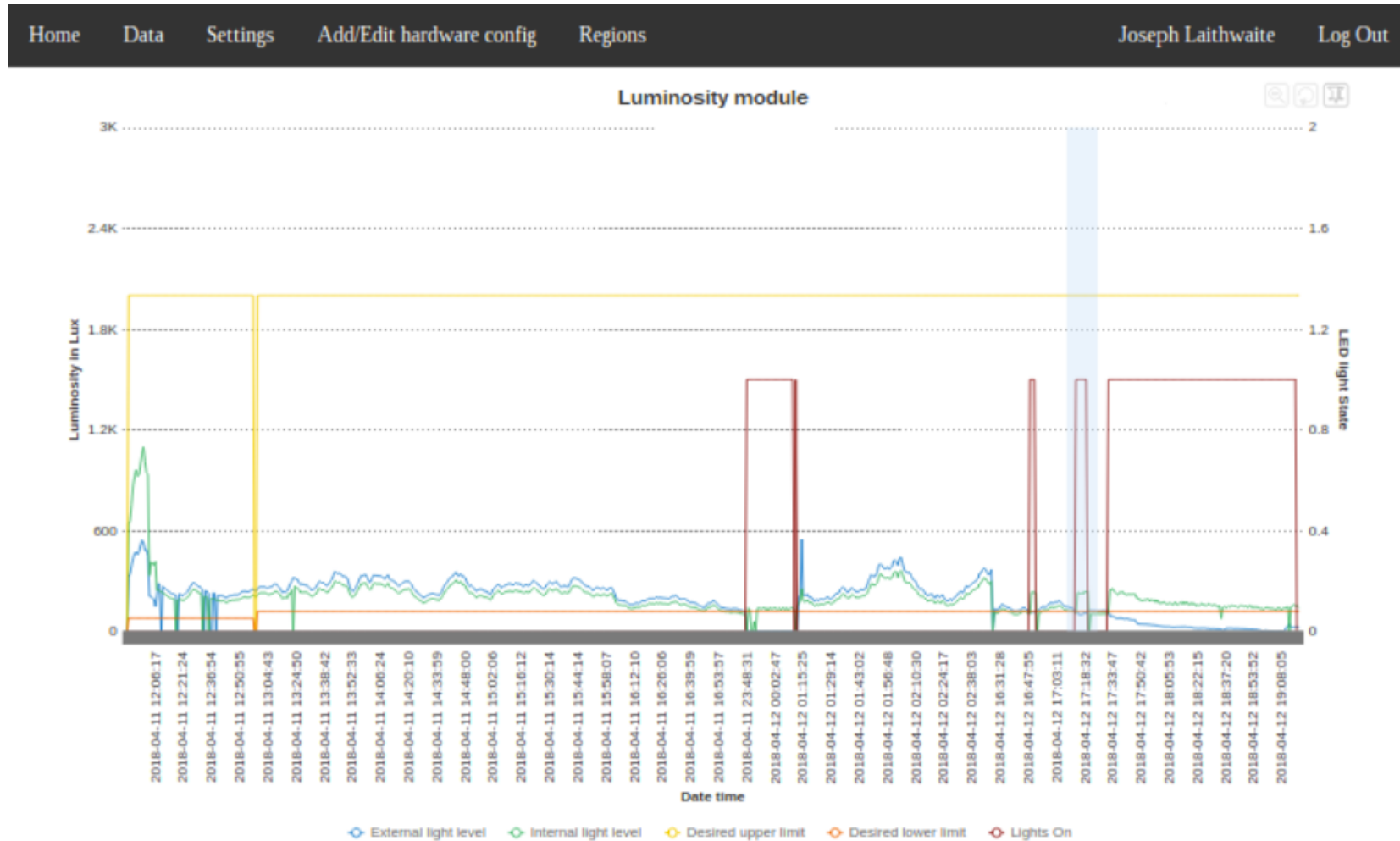
Figure 10.13 - Screenshot of the full data recorded by the Light module including desired conditions, sensor reading and LED actions
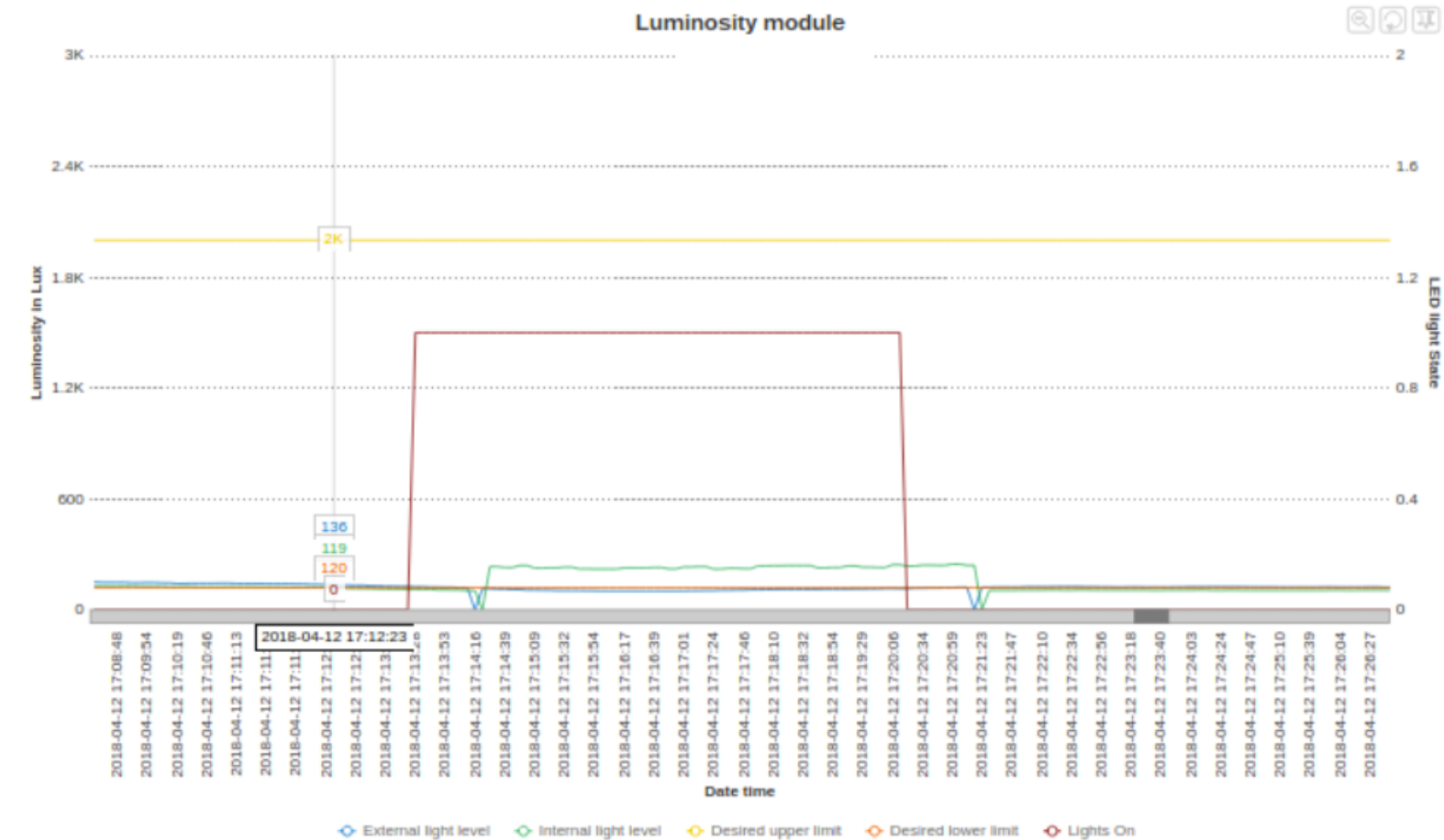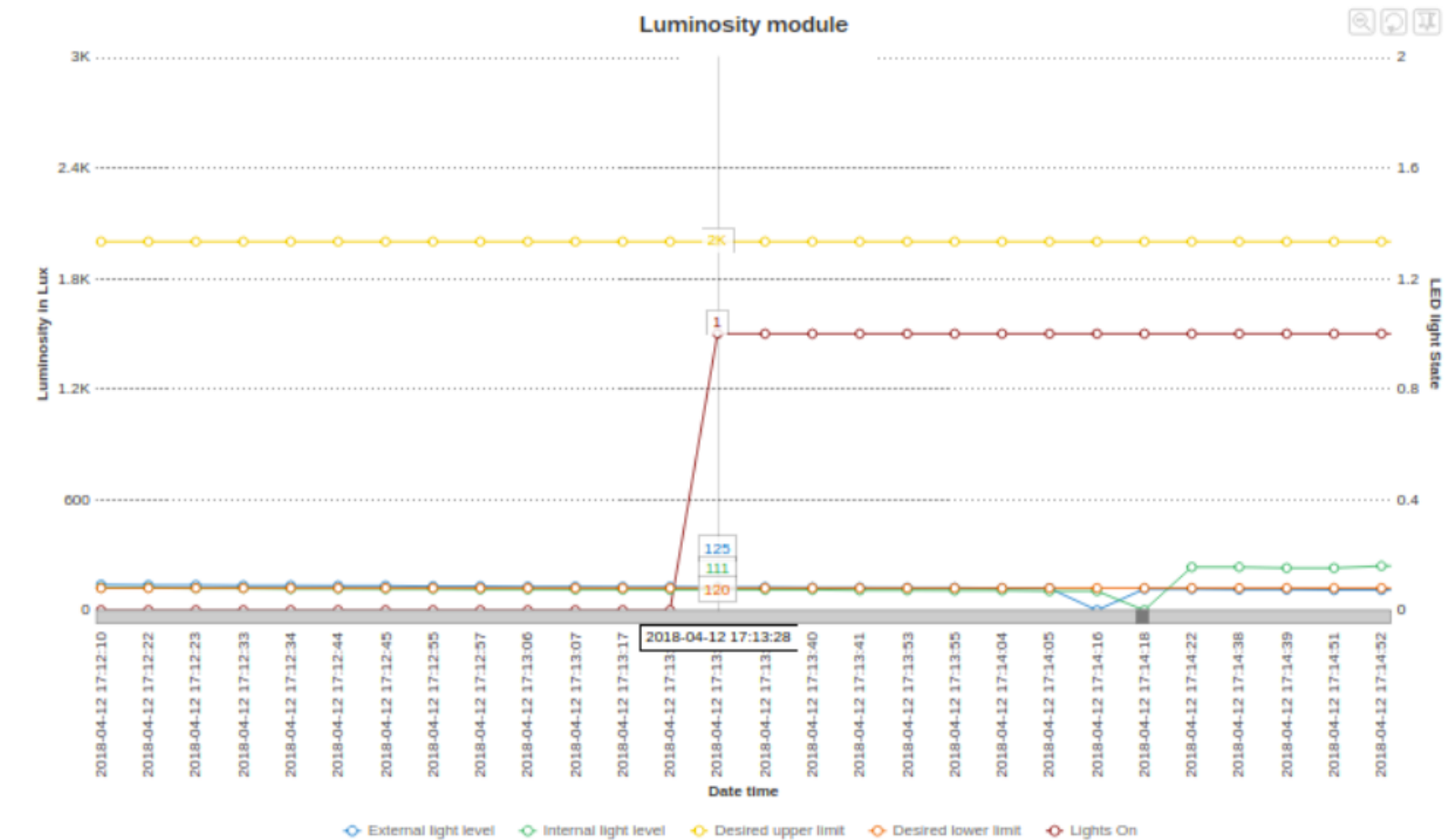
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Figure 10.14 - By highlighting a section from the graph in figure 11.13, a zoomed in graph is displayed. Here the data surrounding a turn on and off

Figure 10.15 - screenshot of a zoomed in section of the luminosity module graph with values of the time on time for the Lights
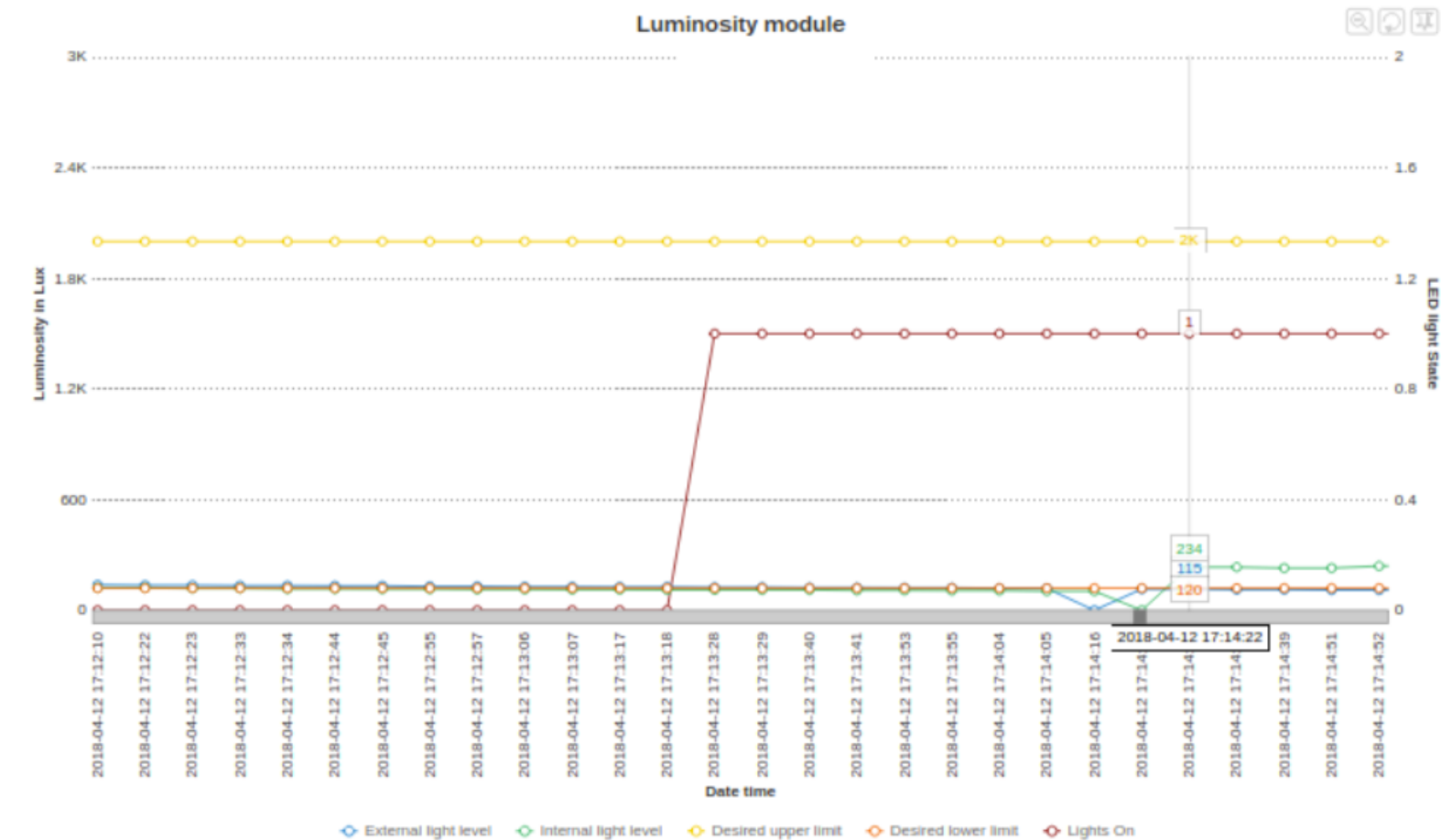
Figure 10.16 - Screenshot of luminosity module graph showing the time at which a change was noticed in light level after LEDs were turned on

Temperature Module
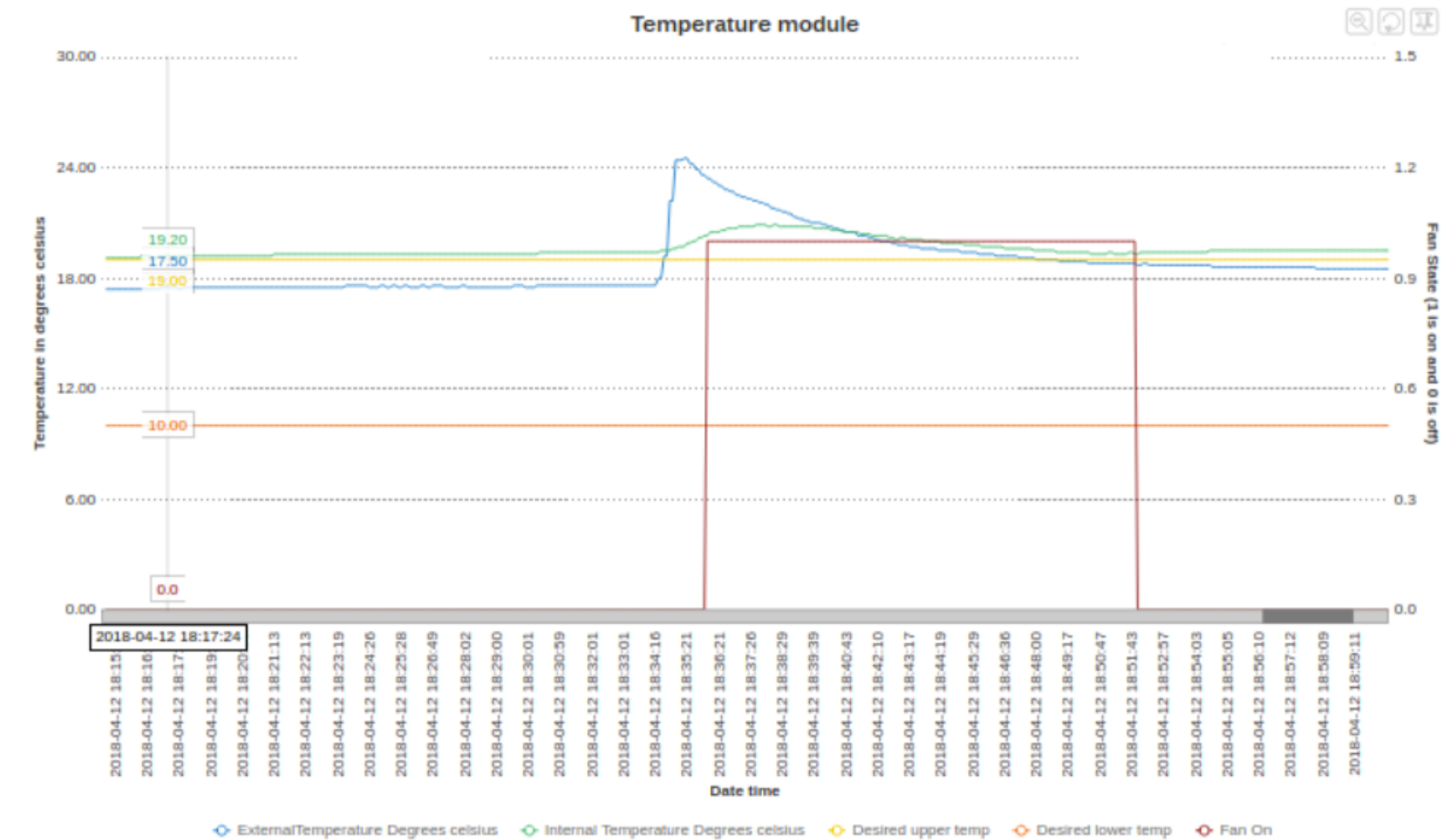

Figure 10.17 - Full graph of temperature module data

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Figure 10.18 - Zoomed in graph of temperature module whilst a heat source was applied to the system
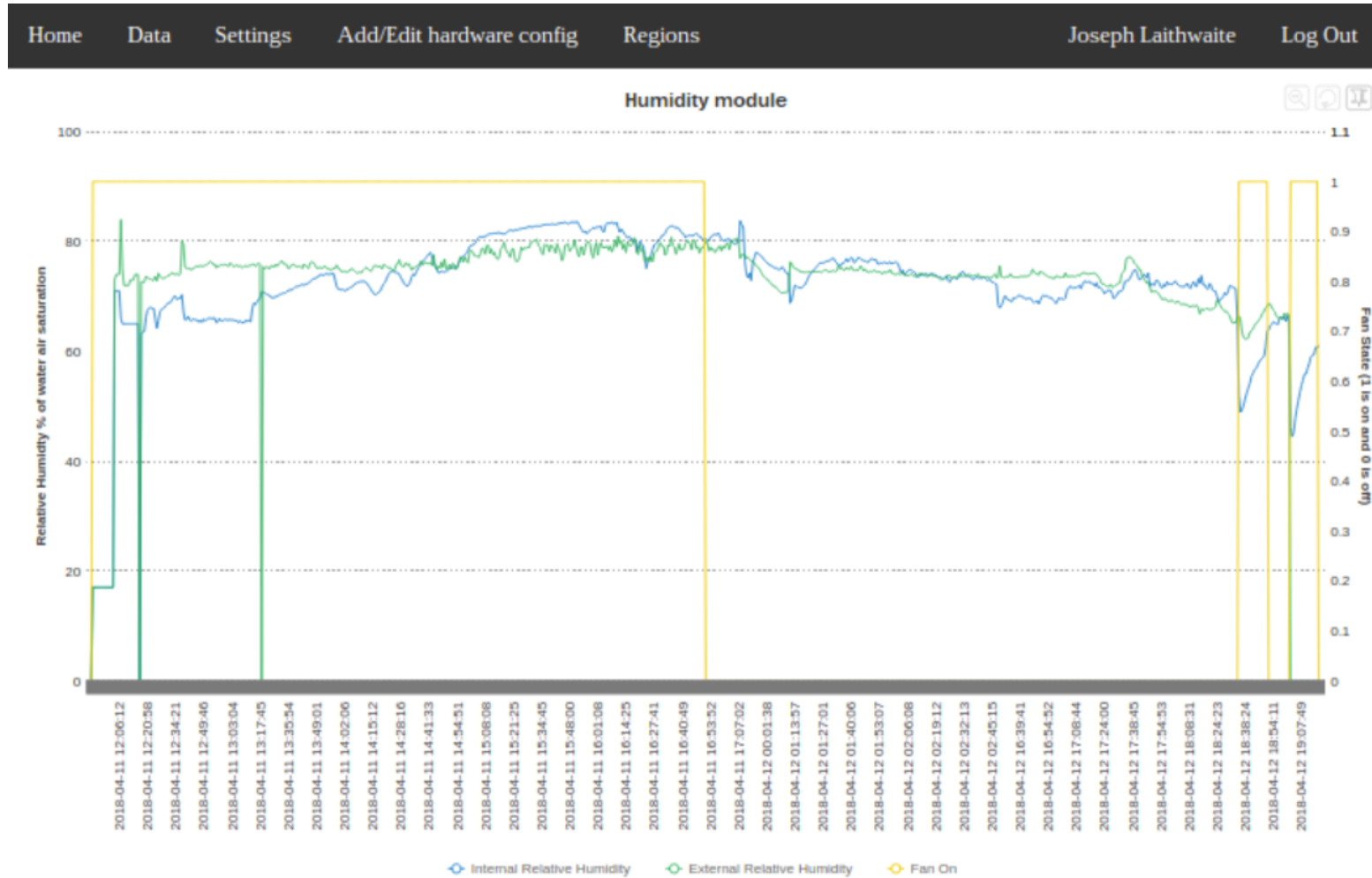
Figure 10.19 - Full graph for the humidity modules data, this has no desired levels set and the fan's state is set for the temperature module
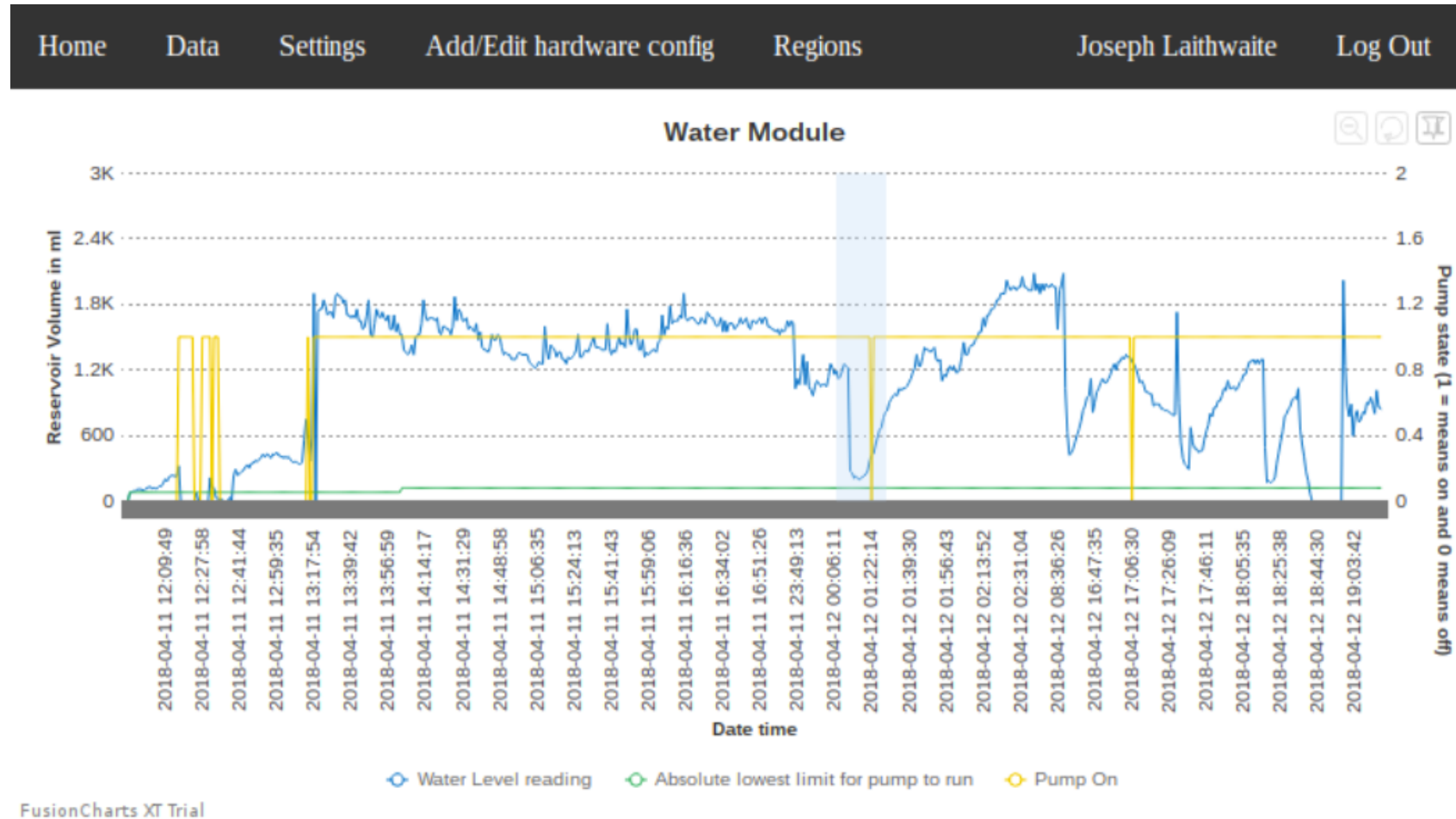
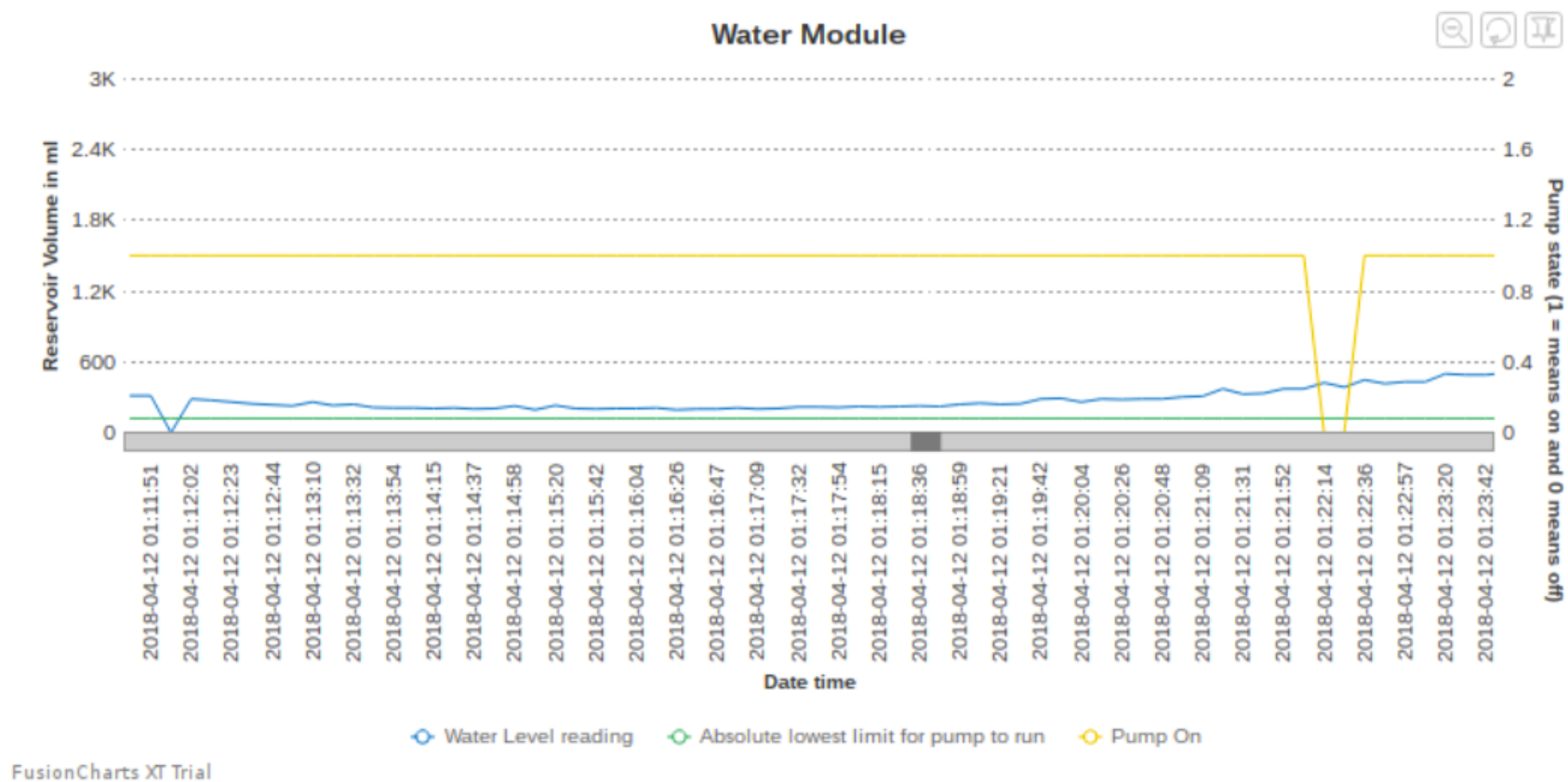*Figure 10.20 - Full graph of water module data*

Figure 10.21 - zoomed in graph of water module showing the pumps response to the water sensors removal from water