

Technical plan: Remote monitoring and automation system of STM-MBE

Here, I propose to create an application program that will provide users with a semi-automated platform for controlling the temperature of the substrate heating and effusion cells based on several important factors such as the pressure of the MBE chamber, together with an automated mechanism for opening and closing the cell's shutters. In this way, human errors could be minimized and the user is able to obtain all parameters in real-time which are essential for quality control.

Hardware

Table 1. List of components for part A

Name	Requirements	Est. Price (HKD)
1 x 24-Port Gigabit Ethernet Switch	-	900
10 x Cat 6a/7 Ethernet cable (1.5 m)	-	200
1 x Cat 6a/7 Ethernet cable (20 m)	-	100
2 x GPIB male to male cable	-	400
6 x RS-232 male to male cable	-	300
4 x SUBS 3500/COMMS/EA (Eurotherm 3408 Ethernet module)	-	6300
8-port serial to IP converter	-	1400
2x 1-ports GPIB to IP converter (Optional)	-	4000
TOTAL		13600 (9600)

Network diagram

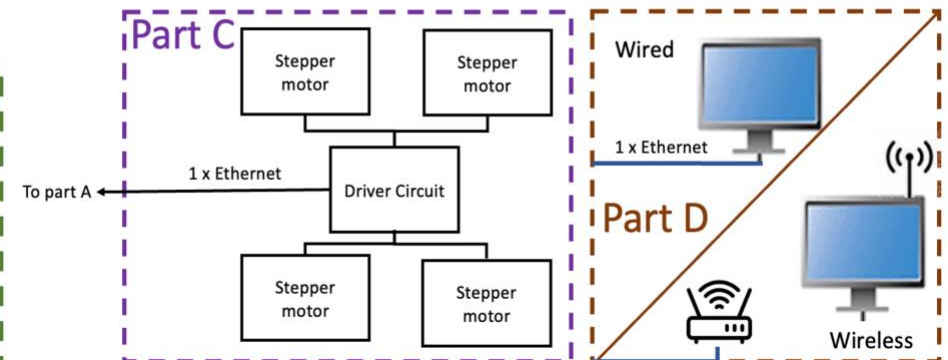
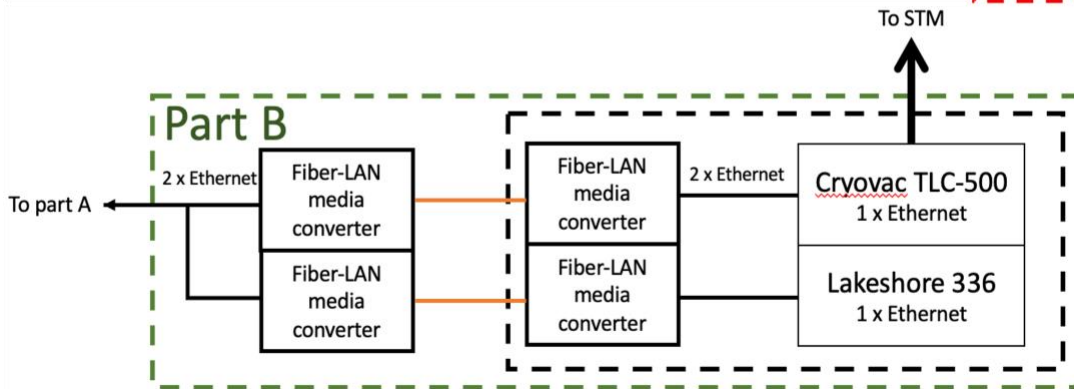
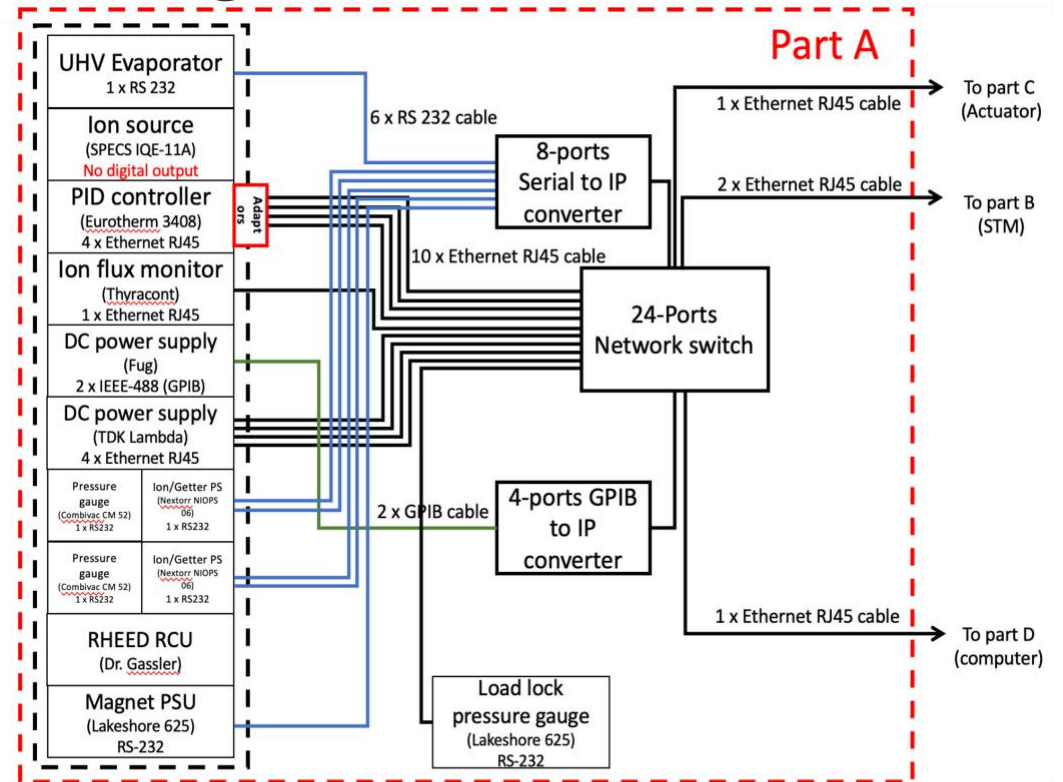
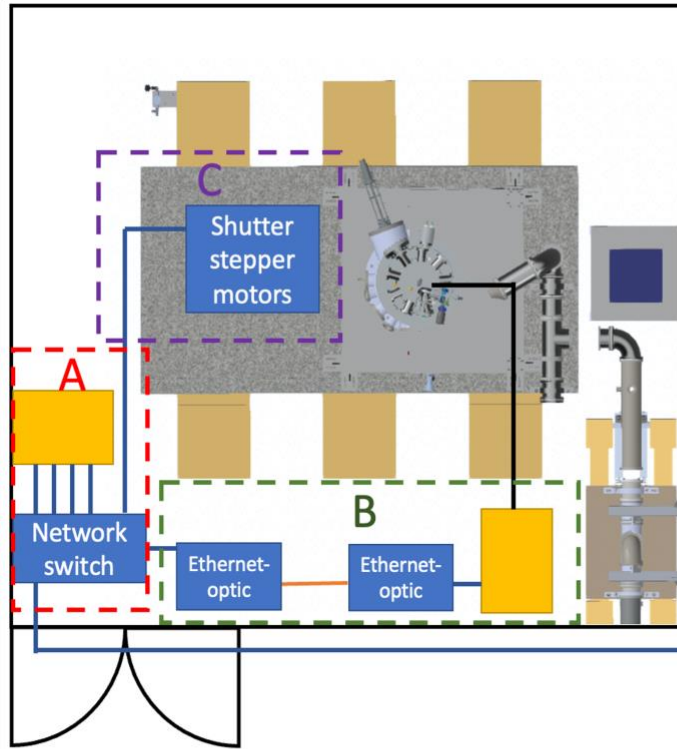


Table 2. List of components for part B

Name	Requirements	Est. Price (HKD)
4 x Fiber-LAN media converter	-	2400
4 x Cat 6a/7 Ethernet cable (2 m)	-	80
2 x Fiber Optic Patch Cable (5 m)	-	100
TOTAL		2580

Table 3. List of components for part C

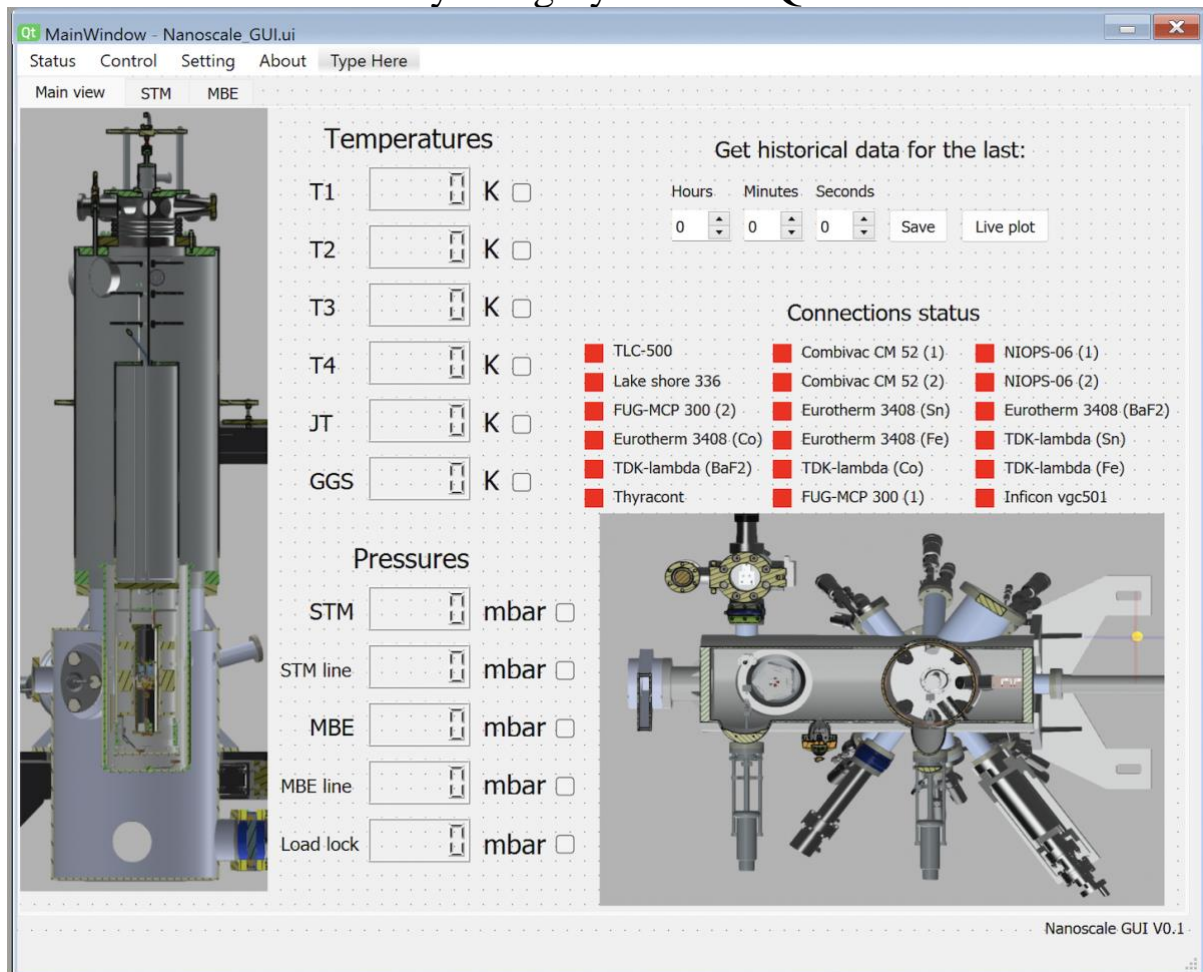
Name	Requirements	Est. Price (HKD)
4 x Stepper motor	-	640
1 x Stepper motor driver	-	170
1 x Microcontroller board	-	200
TOTAL		910

Table 4. List of components for part D

Name	Requirements	Est. Price (HKD)
1 x Wifi Router (optional)	-	600
TOTAL		600

Software

Mainly using PyVisa and QtGUI



Targets:

1. Obtain real-time data, log the historical data into .txt file and plot the output. **(1 month)**
2. Control over processes like beam flux calibration and cooling down of the substrate or effusion cells. **(2 months)**
3. Control over the shutter of MBE. **(3 months)**

Hardware references:

- **Ethernet switch:**

NETGEAR 24-Port Gigabit Ethernet Plus Switch
(JGS524E) [HKD1,439.18] **(For future expansion)**



- **3508 Process controller Ethernet (Modbus TCP)
x 4**



View of cable which
may also be ordered
separately as Part No
SUB3500/COMMS/EA

- **Ethernet cable x 9**



x 4



Hardware needed (For second step)

**8 Serial Port RS232 RS485 to Ethernet Converter
ZLAN5843A Support Modbus TCP Protocol**



**Prologix Gpib to Ethernet (Lan) Controller
(2000HKD)**



**Tripp Lite external multimode media converter
N784-001-ST [572 HKD]**



D-Link Wireless AC750 AC750 WiFi Router [552 HKD]

