

Shift manual for the magnetic field mapping (2019.05.20)

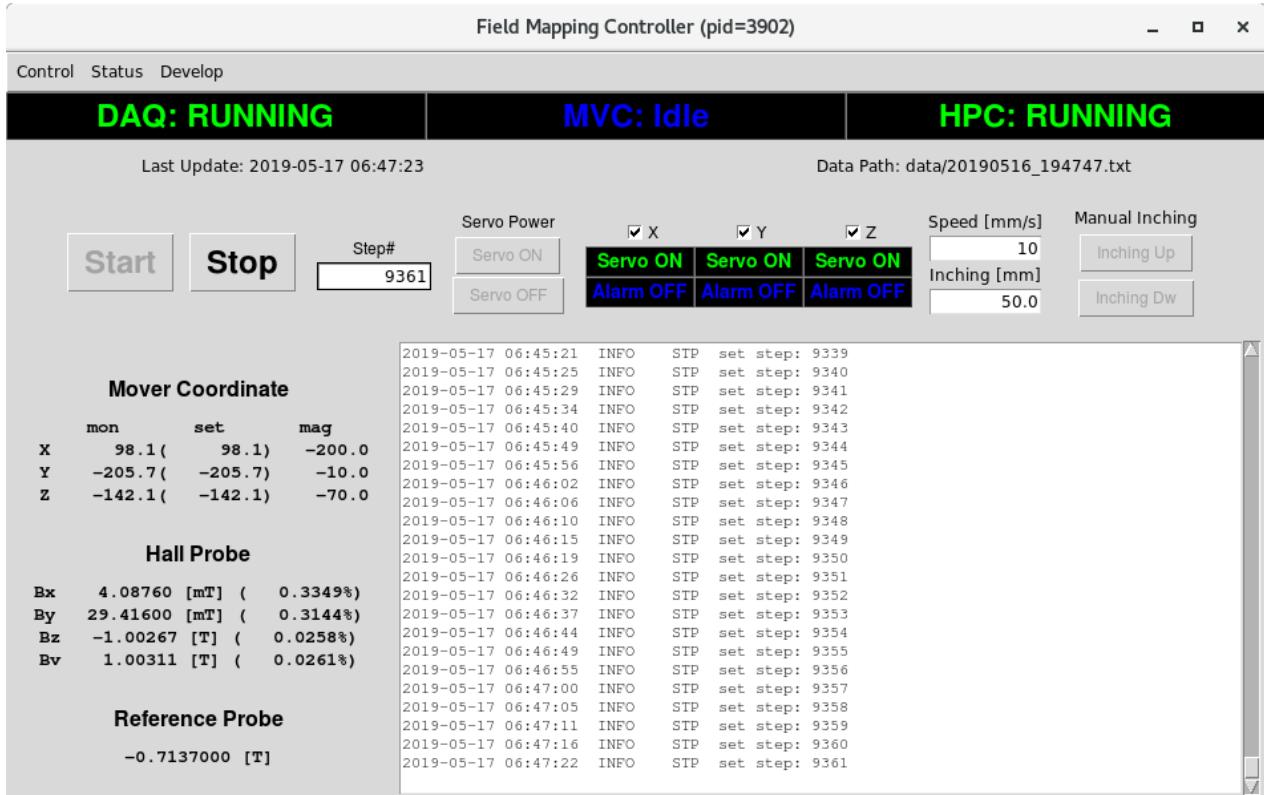
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Launch controller

Use jhterm1 (CentOS7 is installed in Mac-Pro) for the field mapping at ERL. Launch the controller at the work directory.

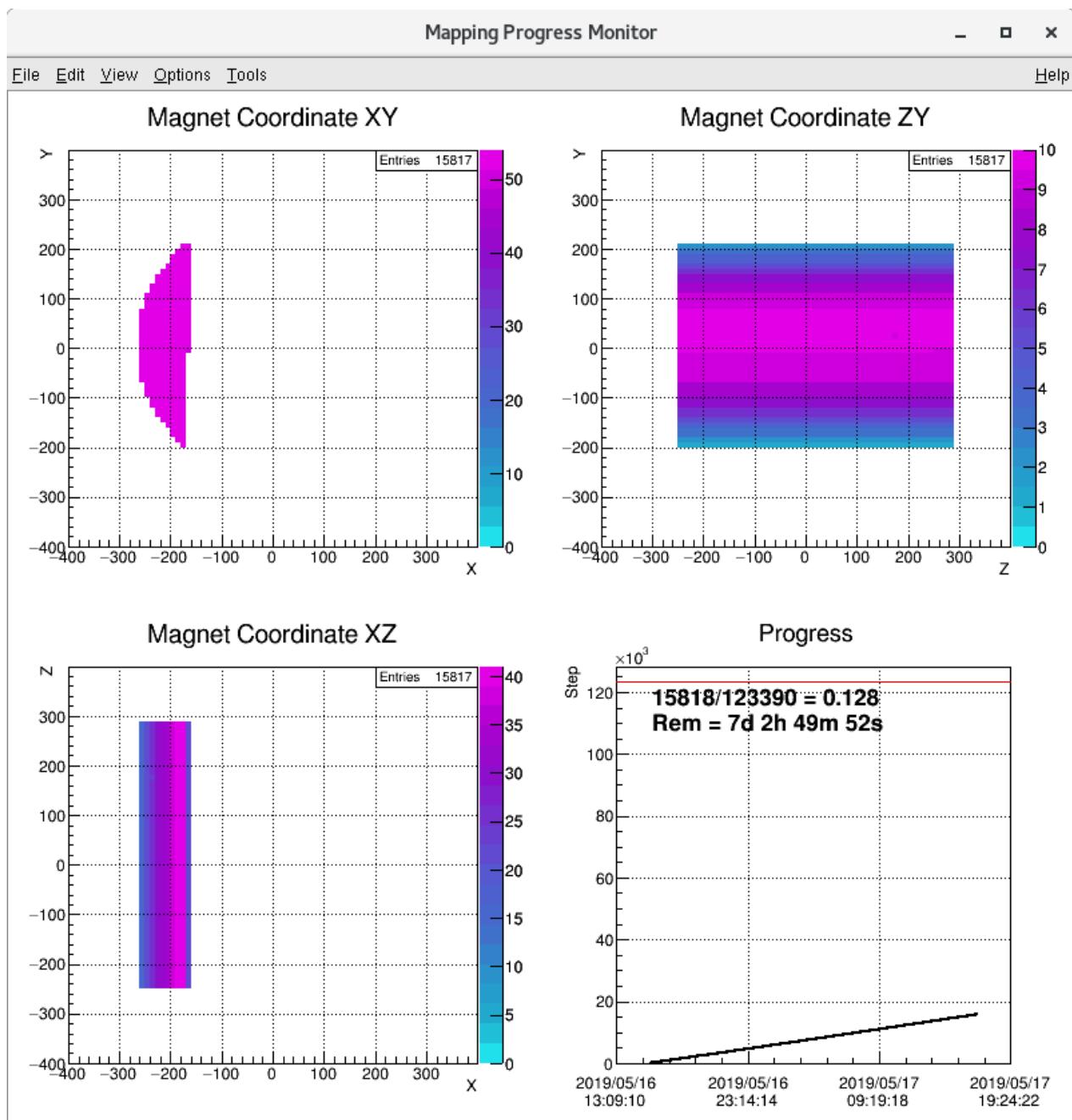
```
[jh@jhterm1 ~]$ cd ~/work/magfield
[jh@jhterm1 magfield]$ ./controller.py
```

The following GUI is launched. Top three labels indicate DAQ status, Mover controller status, and Hall probe controller status. Servo ON/OFF and Inching Up/Dw buttons are normally not used.



```
[jh@jhterm1 magfield]$ ./progress.py
```

This shows not the field value but the progress.



Mapping process

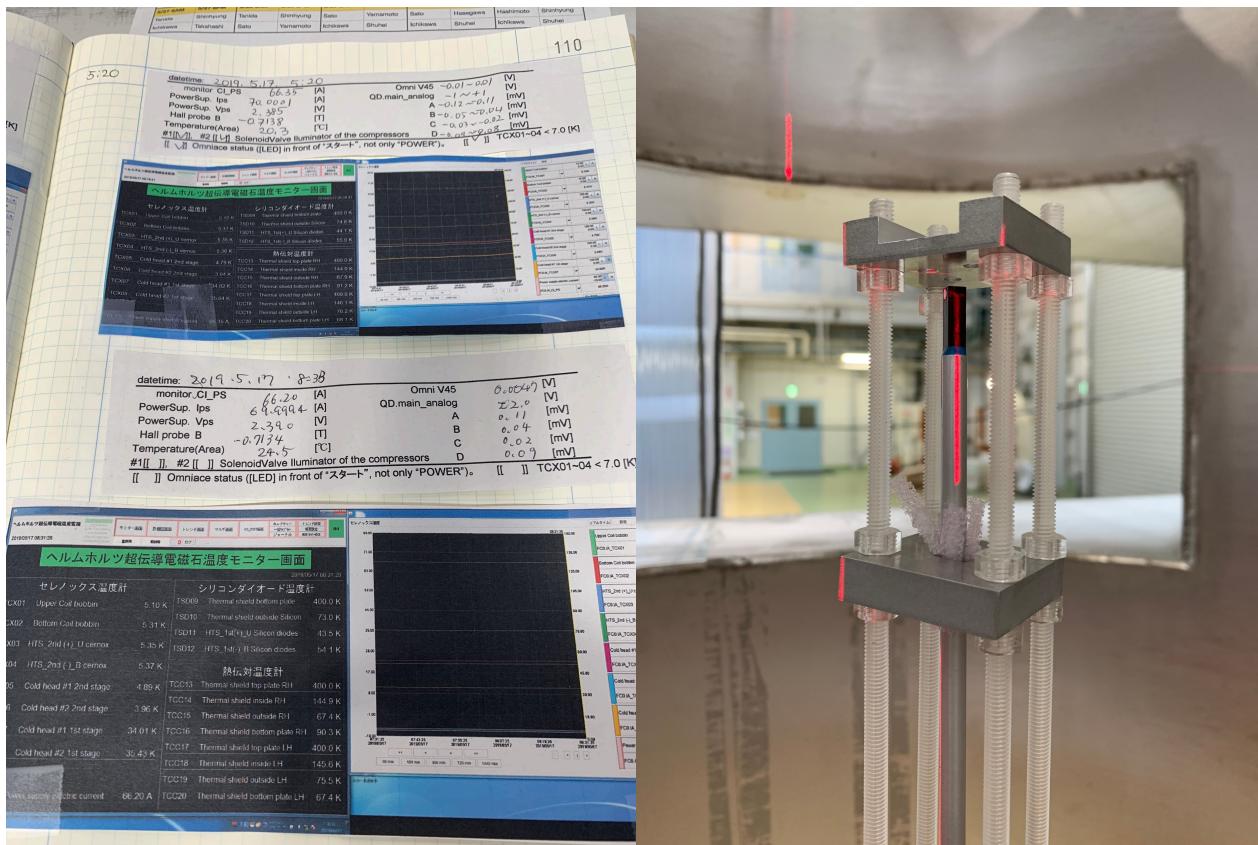
1. Move to the next position. MVC status becomes MOVING.
2. Wait until the field deviation become small (while HPC status is DEVIATE).
 - B_x, B_y : $\text{stddev}/\text{mean} < 0.6\%$ (when $B < 1 \text{ mT}$, not care)
 - B_z : $\text{stddev}/\text{mean} < 0.06\%$
3. Save data, and repeat 1—3.

It takes 6 seconds to process one step. The current parameter has totally 123,390 steps, which corresponds to 8.5 days.

Since the step parameter is not perfectly ordered in the shortest distance, it is possible to take long time to move to the next position on the edge part.

Shift work

- See the step progress. Nothing special to do.
- Print out a desktop screenshot of the Windows PC. Write the magnet status sheet. Do this every 3 hours.
- Check the hall probe position at the magnet center every day (Experts do).
 - Stop DAQ, and memo the step number.
 - Push "Go to center" in Control tab. Move to the center position.
 - Check the hall probe position with the laser by eyes.
 - **Reduce the step number by 60**
 - Start DAQ
- If you start/stop DAQ with some reason, log the time, the reason, and the step number. Remember to memo and reduce the step number.



Left shows the magnet log. Right shows the probe position before starting shift.

Troubleshooting

- **DAQ Alarm sounds**
 - Log the error message and take a screenshot.
 - Check the alarm number. See the alarm list to push "Alarm list" in Control tab.
 - If the mover position exceeds the software limitation, the alarm sounds without any

alarm number. In this case, just start DAQ after **reducing the step number by 60**. If the start button is disabled, move to center once.

- If some alarm number is displayed, push "Alarm reset" in Control tab. Push "Servo ON". Start DAQ after reducing the step number.
- If the alarm can not be reset, or DAQ can not start, call experts.

• Too much long waiting time

- If the waiting time for the field deviation is too long (for example, more than a minute), something is wrong.
- Call experts.

• Other error : controller freezing, communication error, ...

- Log the error message and take a screenshot. The error might be displayed not on the controller but in the terminal.
- Close the controller window and restart controller.py.
- If it does not recover, call experts.

If you do not know well in any cases, feel free to call experts.

About the magnet operation, follow the magnet manual.

Alarm list		
Code	Alarm name	Content
1	Over voltage of motor power	An overvoltage was applied to the motor power supply.
3	Voltage drop of control power supply	The input power supply voltage is low.
4	Voltage drop of motor power supply	The motor power supply voltage is low.
5	Serial communication error	An error of serial communication on CN3.
11	Parameter error	An invalid value is set for the parameter.
21	Movement with servo off	Movement command was input with servo off.
22	Zero return unfinished	Movement command was input with zero-return unfinished.
23	Zero return timeout	Zero-return command was not finished in time.
24	Current position write error	Write signal (PWRT) was input during the manual movement.
25	Position data error	The program table is invalid.
31	Position command error	The actual speed exceeded the maximum.
32	Position over-residual	The position residual monitor/command exceeded param#30.
33	Software limit error	The current position exceeded param#3, 4
34	Pressing range error	The motor was pushed back while pressing.
35	Encoder communication error	Communication error with the encoder happened.
36	Encoder error	An error of the encoder itself happened.
37	Battery error	The battery is disconnected or empty.
38	Battery low	The battery voltage is low.
39	OT sensor error	OT (Over Travel) sensor detected an error.
51	EPROM error	EPROM error happened at the booting.
52	Excitation error	No encoder feedback was found at the excitation detection.
53	Motor overload	The motor was overloaded.
54	Servo error	The motor was off more than 2 seconds while moving.
55	Driver controller overheat	The temperature is too high in the driver controller.
56	Electronic thermal error	High current was applied over the protection circuit.
57	Motor overcurrent	Overcurrent was applied to the motor.
58	Movement error	Thrust was detected in the opposite direction to the movement.
59	System alarm	An error of micon in the driver controller happened.
61	Regenerative circuit overload	Regenerative circuit was overloaded.
62	IPM module error	An error of motor drive circuit happened.
63	Emergency stop	Emergency stop is on.

Others

- Develop mode

Do not use this mode.

- Free DAQ mode

When the check button "Free DAQ mode" in Control tab is on, you can start DAQ without mover stepping. In this mode, the deviation check is off.