Istituto Nazionale di Fisica Nucleare
LABORATORI NAZIONALI DI LEGNARO

Laboratori Nazionali di Legnaro – INFN

IRIS (Isolpharm Radionuclide Impantation Station) development – Machinery and Control

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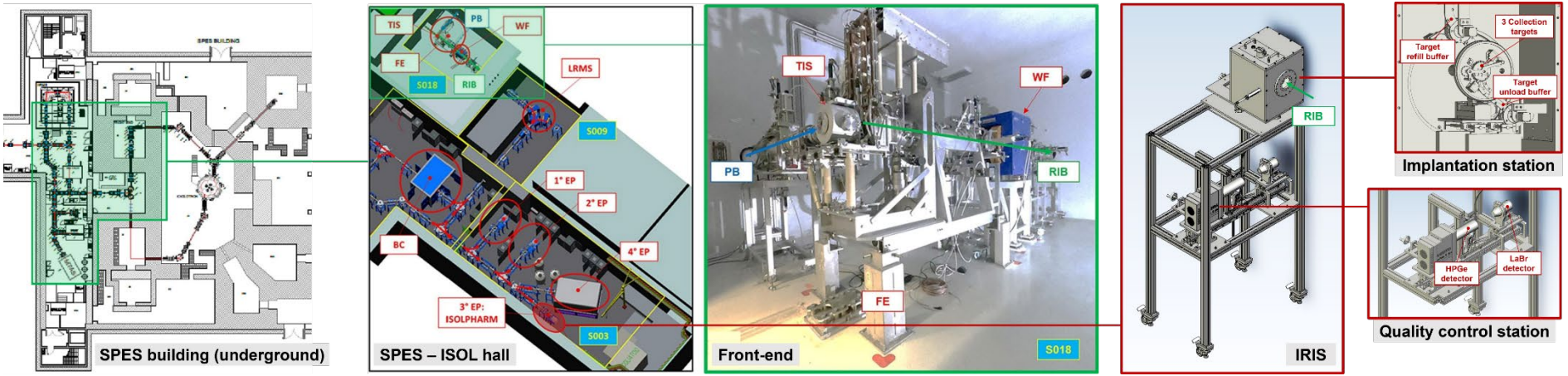
Outline

I. System overview
II. Optimization on machinery and control
III. Conclusion and prospect

System overview



IRIS (Isolpharm Radionuclide Implantation Station) - The main equipment responsible for the radionuclides collection in the context of ISOLPHARM project, meant to deliver high purity novel medical radionuclides (^{111}Ag, ^{28}Mg etc.) using ISOL technique

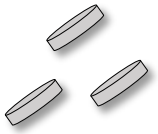
System overview – life cycle

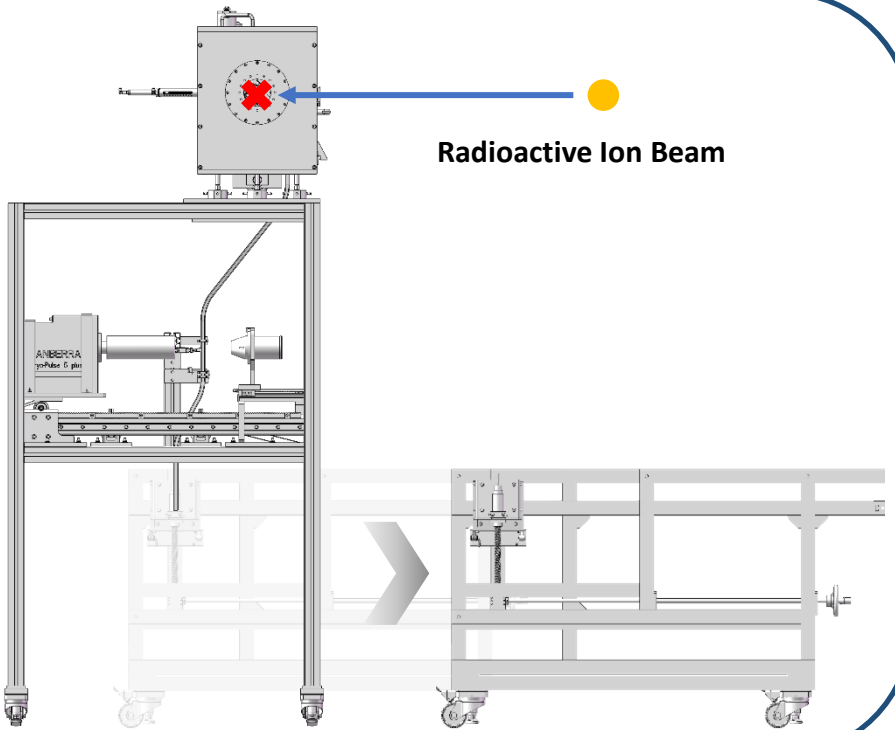
Implantation substrate development

Irradiation and characterization

Transportation

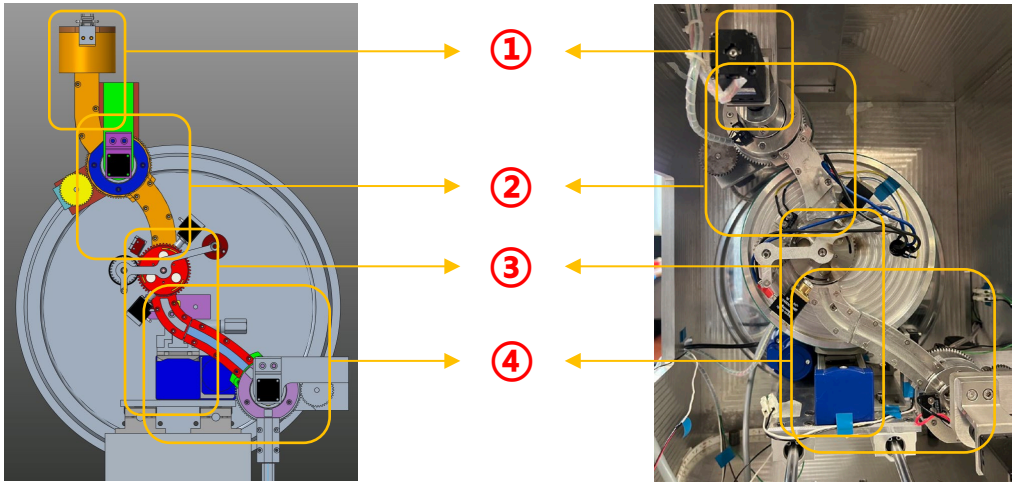
Post-processing



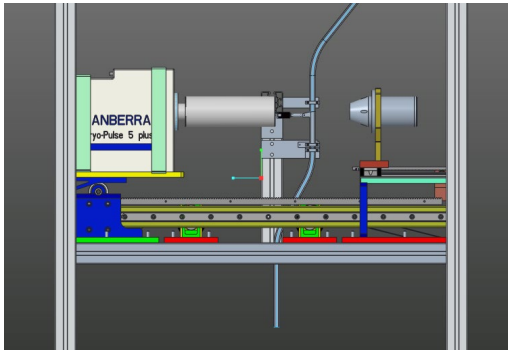


System overview – charging workflow

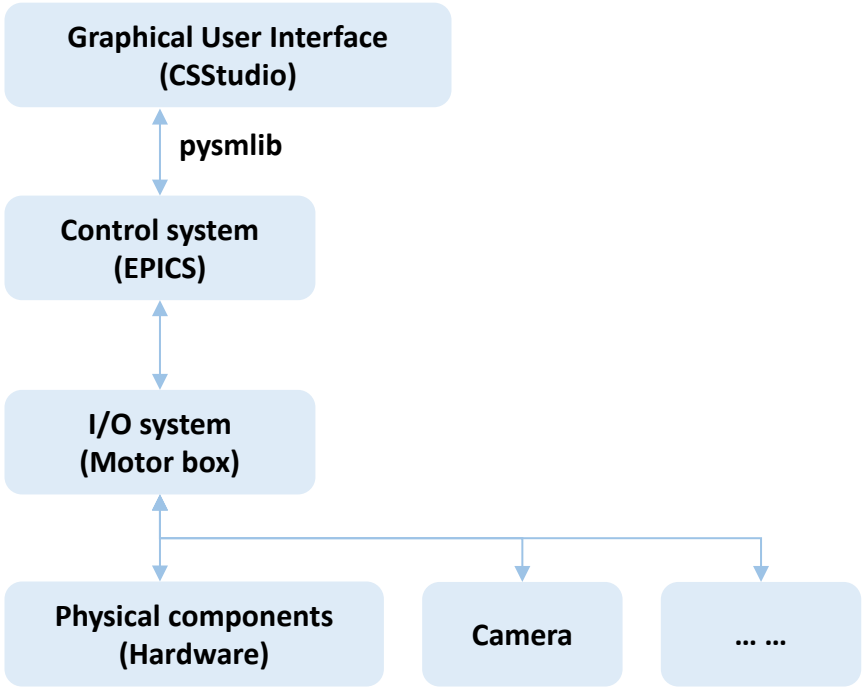
① Loading → ② Charging → ③ Coupling and Irradiation → ④ Discharging → ⑤ Quality control



⑤



System overview – layer architecture



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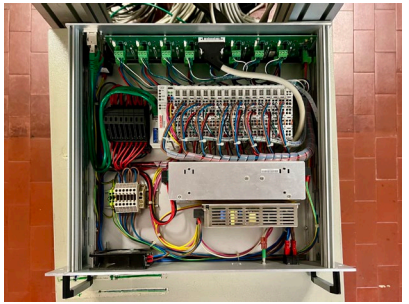
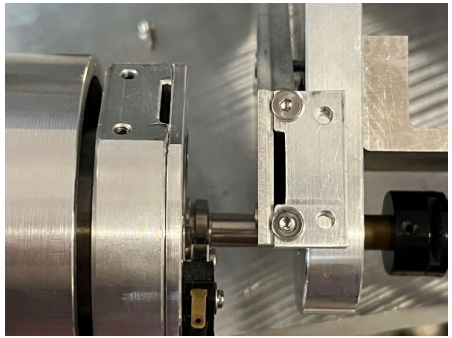


Optimization on machinery and control

Pellet – with thickness of 1.36~1.7 mm (i.e. 200~250 mg) is preferred for going through sliders & buffers



Thickness of pellets			Depleted
Number	Thickness	Note	In use
#	mm		Too thin
1	1.36		Too thick
2	1.25		
3	1.42		
4	1.28		
5	1.44		
6	1.22		
7	1.55		
8	1.45		
9	1.4		
10	1.71	250mg	
11	1.73	250mg	
12	1.74	250mg	
13	1.9	275mg	
14	1.88	275mg	
15	1.86	275mg	
16	2.08	300mg	
17	1.34	200mg	
18	1.36	200mg	
19	1.39	200mg	
20	1.35	200mg	

Charging buffer – Modify the control code to fix the periodically forward and reverse rotation, by only performing homing at system startup

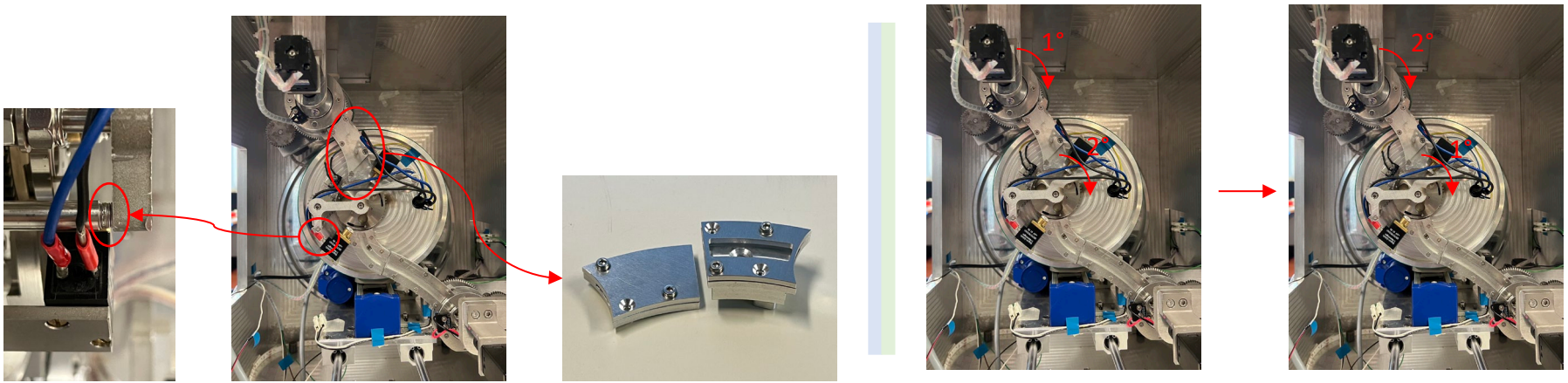
Discharging slider – Polished to enlarge the passageway

Optimization on machinery and control

Central movement – the step loss caused by interference was compensated by

- Modify the support component to adjust the matching between gears
- Modify the charging slider to fix the charging position

- Modify the control code to enhance the robustness of charging process



Conclusion and prospect

- The optimization for both software and hardware is testified by the stability test (repeated operation for over 100 times without major problem)
- Migrating the control logic to **PLC** would enhance the stability and precision of the movements
- More effort will be put on the issues regarding the whole assembly and other general aspects, such as **vacuum, monitoring, integration with the beamline etc.** in next months

The IRIS group

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ISOLPHARM
SPES exotic beams for medicine

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Thanks for your attention!