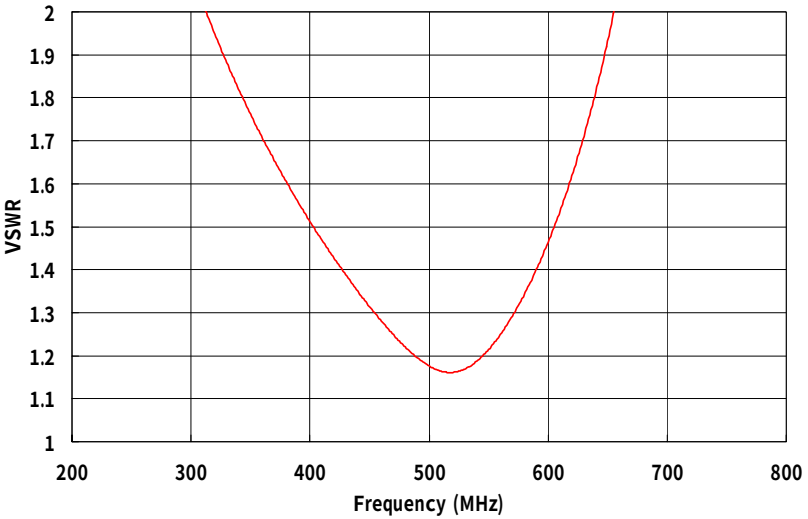
RF couplers of crab cavity

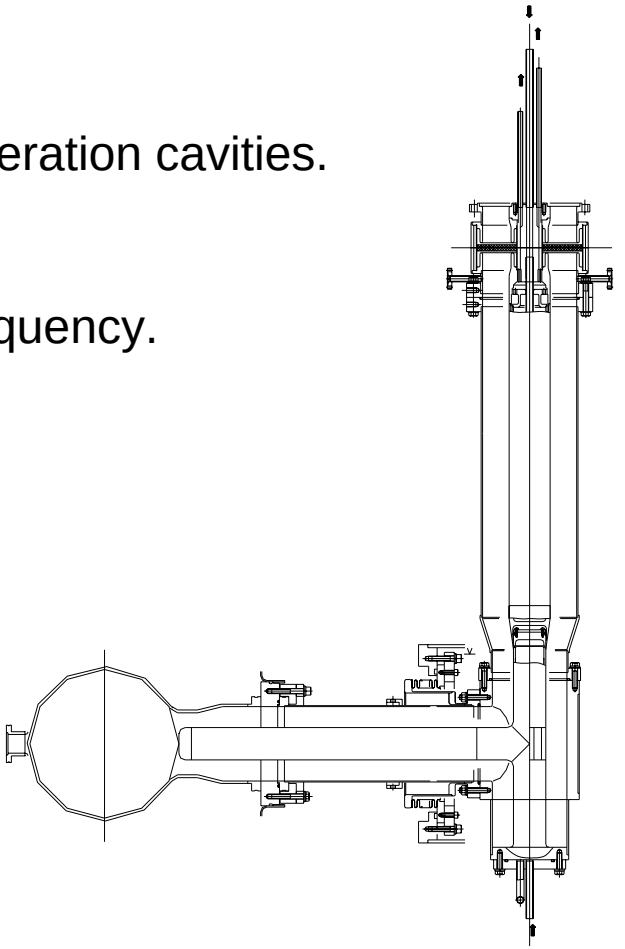
KEKB Crab Cavity R&D Group
(presented by NAKANISHI Kota)

Design of the input coupler

The input coupler was introduced last year.
It's features are following.

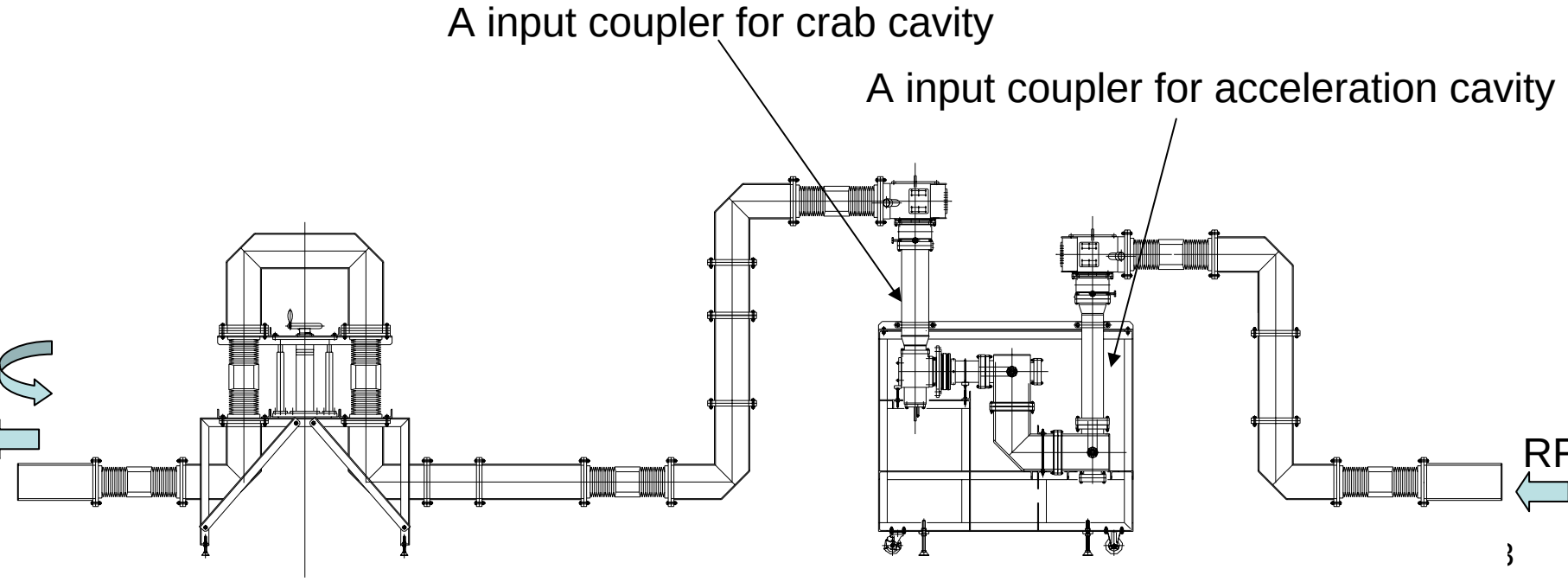
- The RF window is used that was designed for acceleration cavities.
- The maximum input power is 100kW.
- The input coupler has T-stub structure.
- The pass-band of T-stub is adjusted to operation frequency.



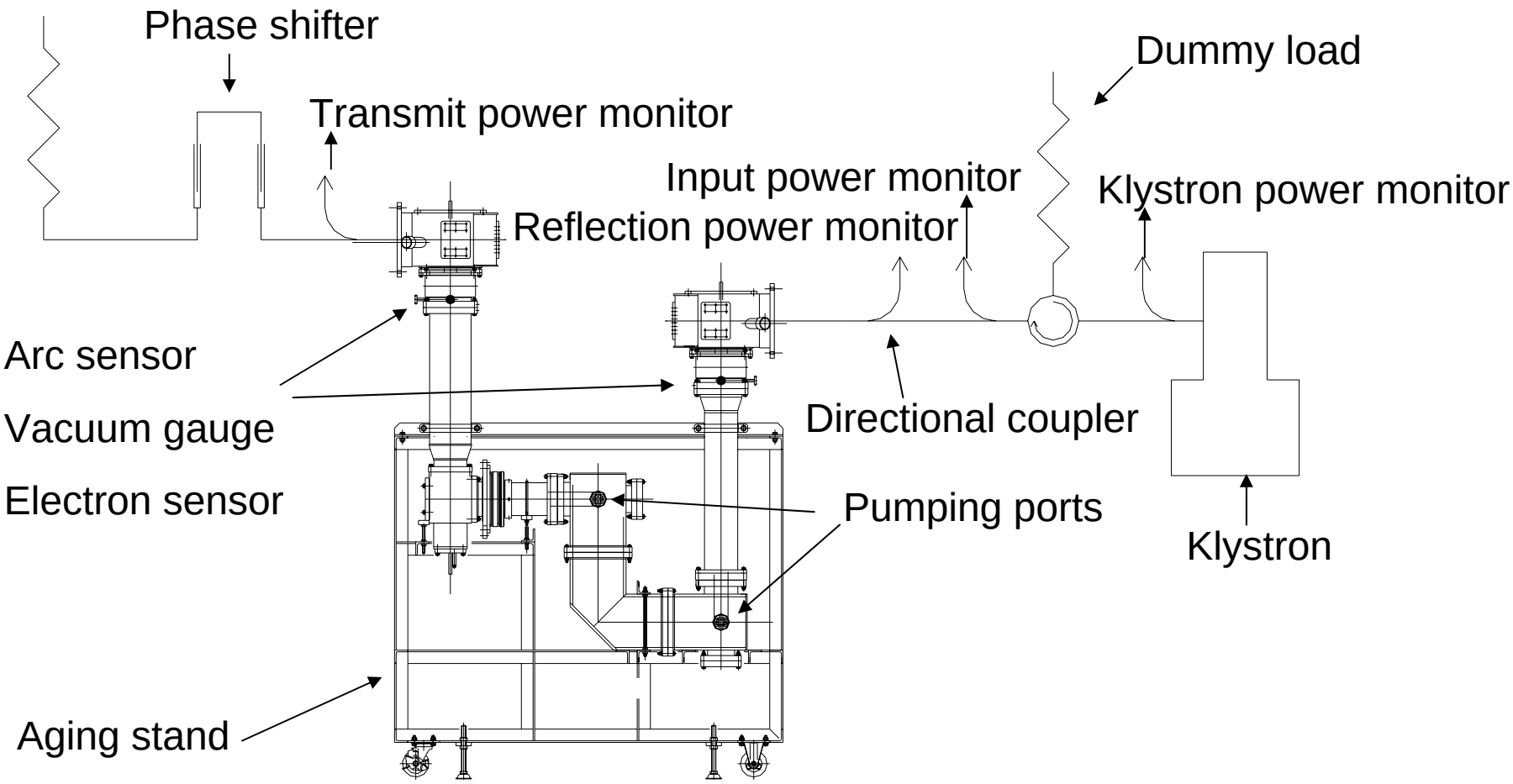


Setup of the input coupler aging.

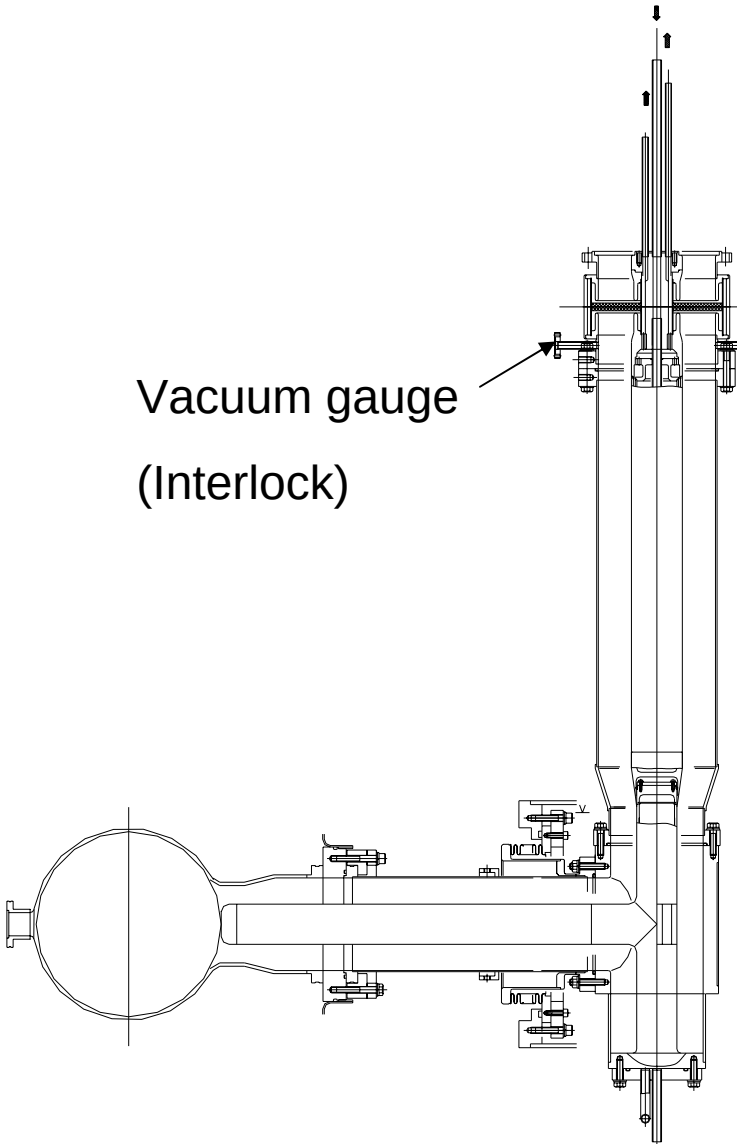
- Almost setups for acceleration cavities are available.
- Connection between two input couplers was made.



Schematic drawing of aging system



Monitor



Electron sensor

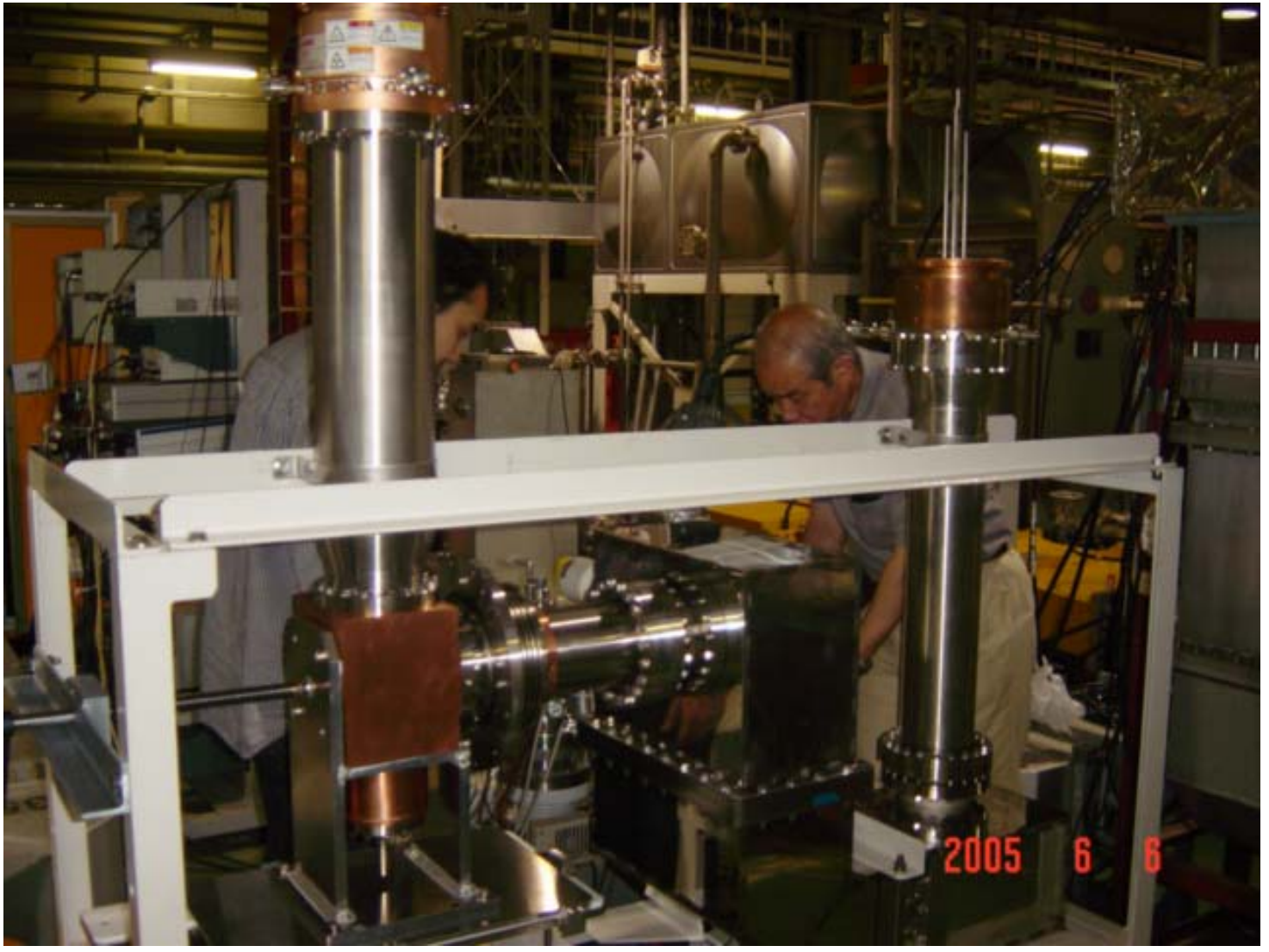
Vacuum gauge

(Interlock)

Arc sensor

(Interlock)

The input coupler aging stand



The input coupler aging stand

Assembly

Rinsing

(pure water→O_3water→pure water)

↓

Drying(N_2 blow)

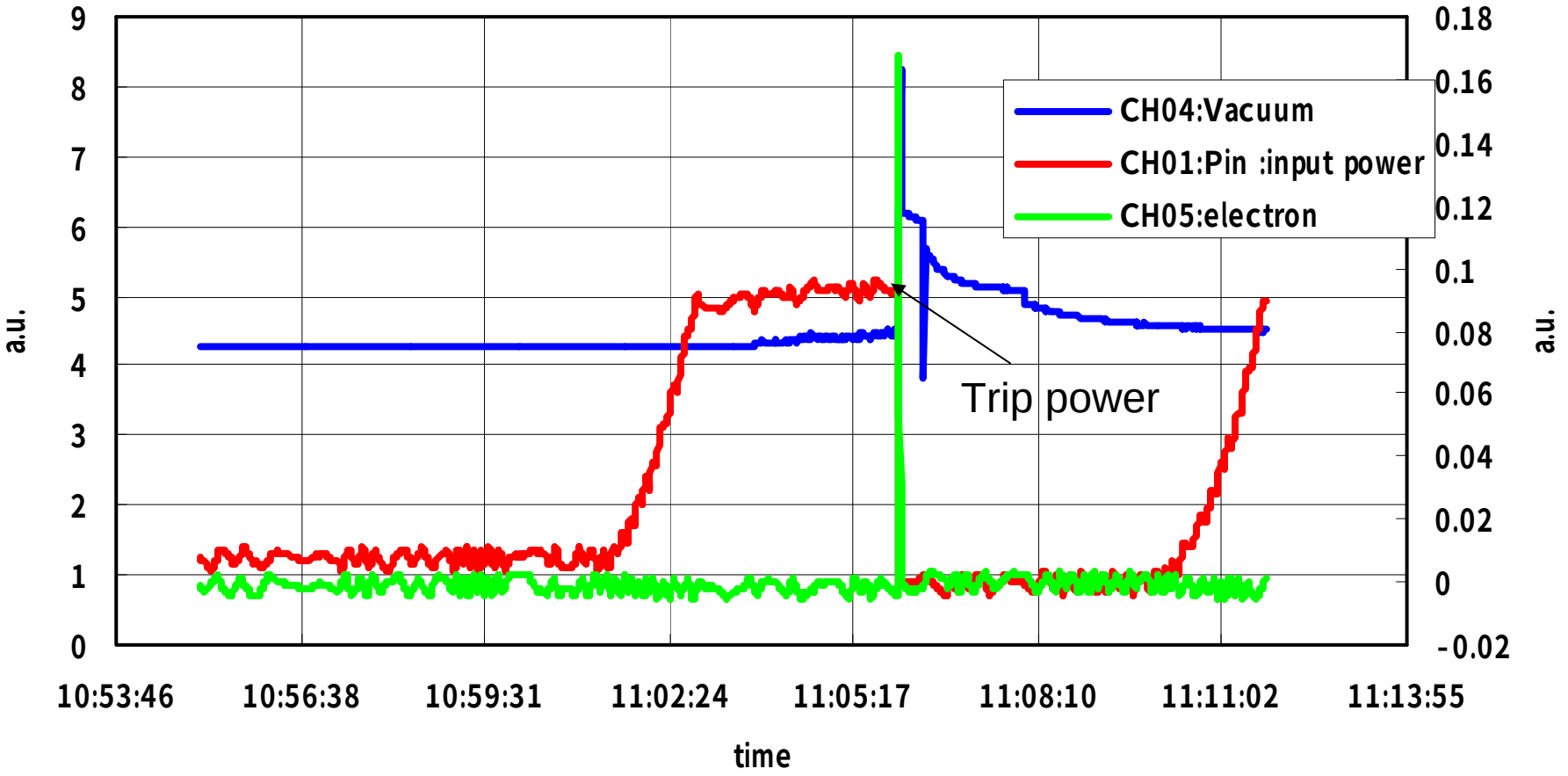
↓

Assembling

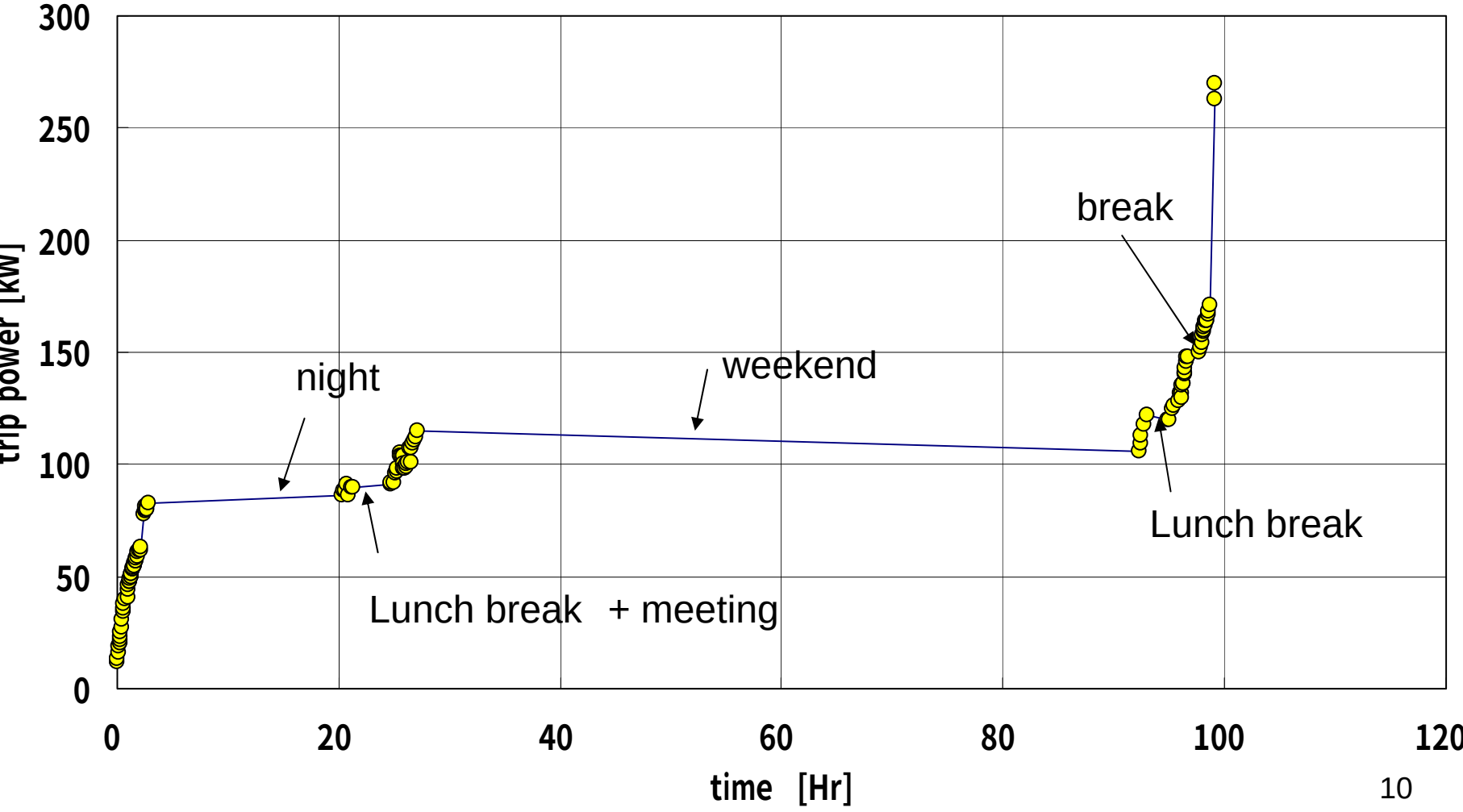
↓

Baking(~80℃)

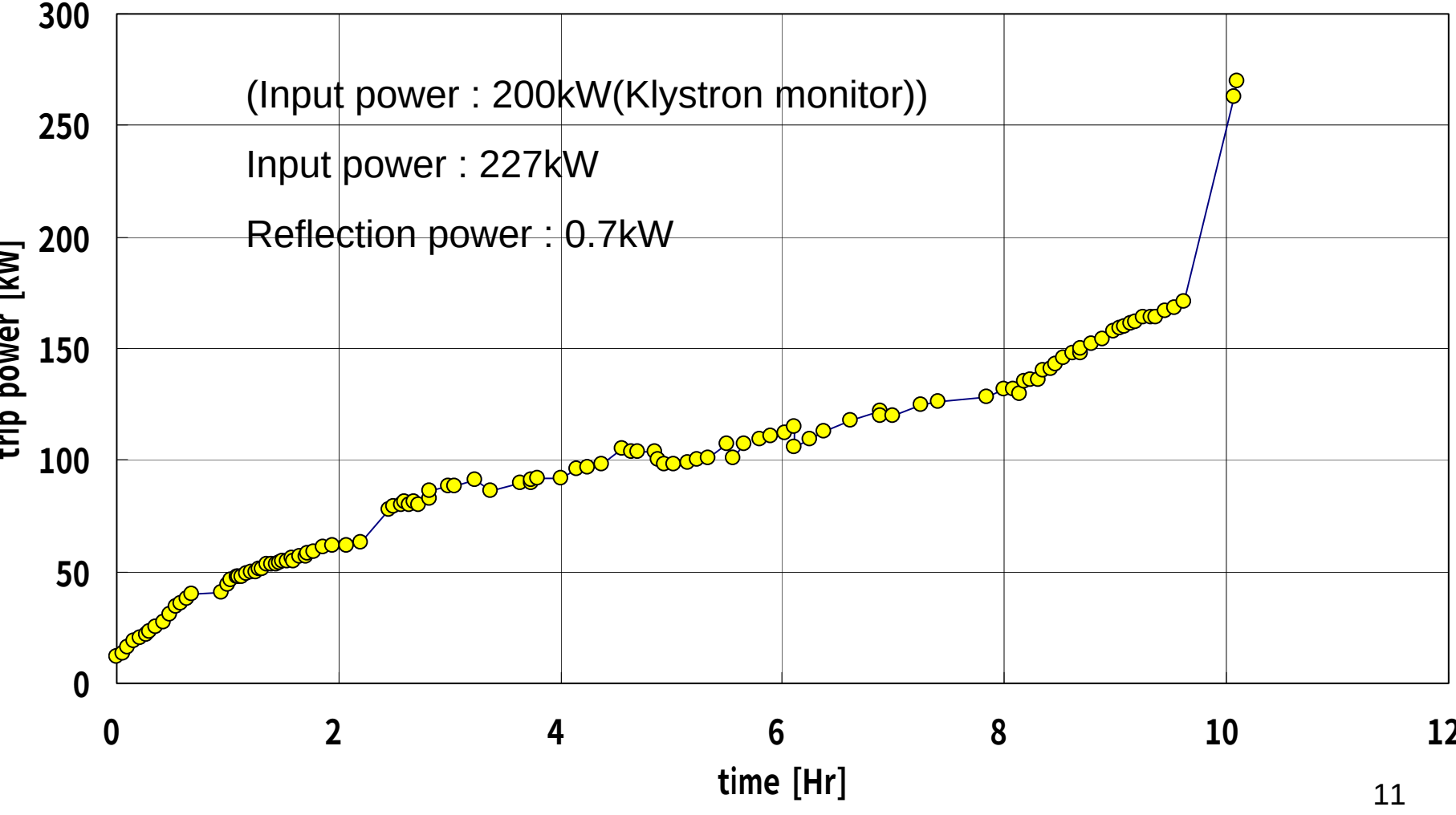
Typical operation of aging



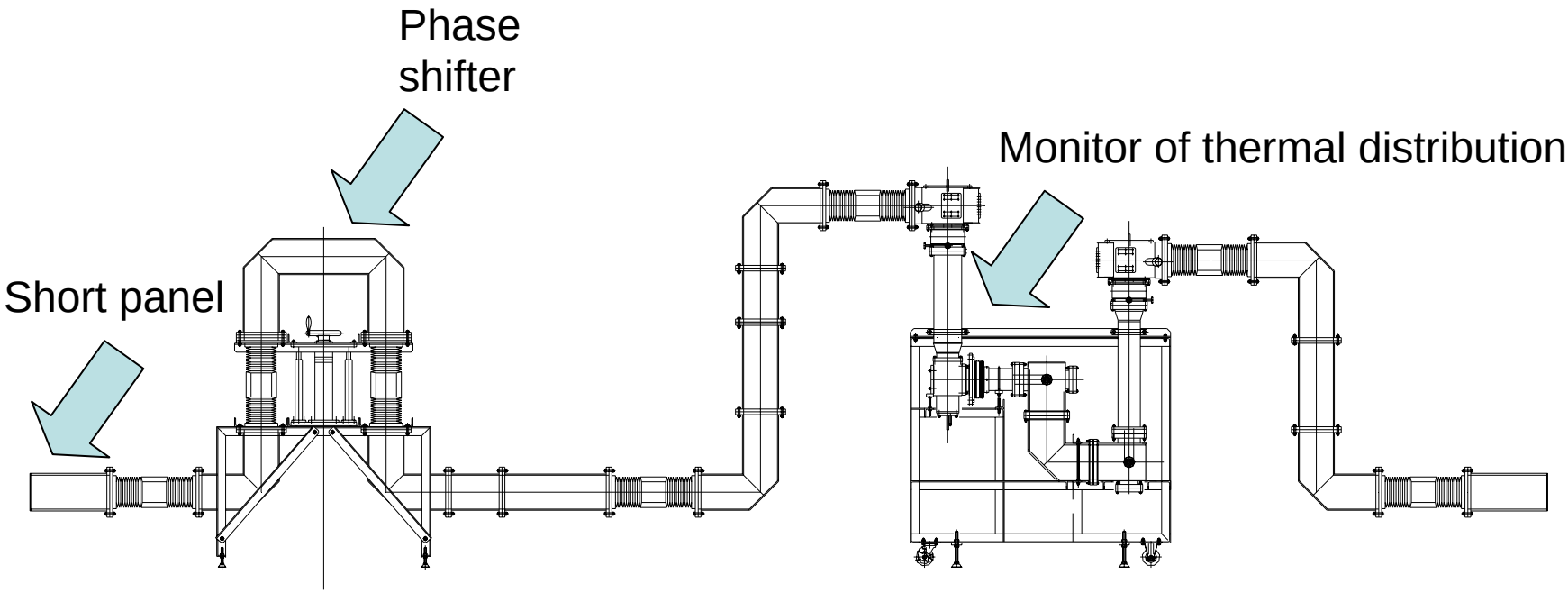
Increase of trip power (traveling wave)



Increase of trip power (traveling wave) (without rest time)



Setup for standing wave aging

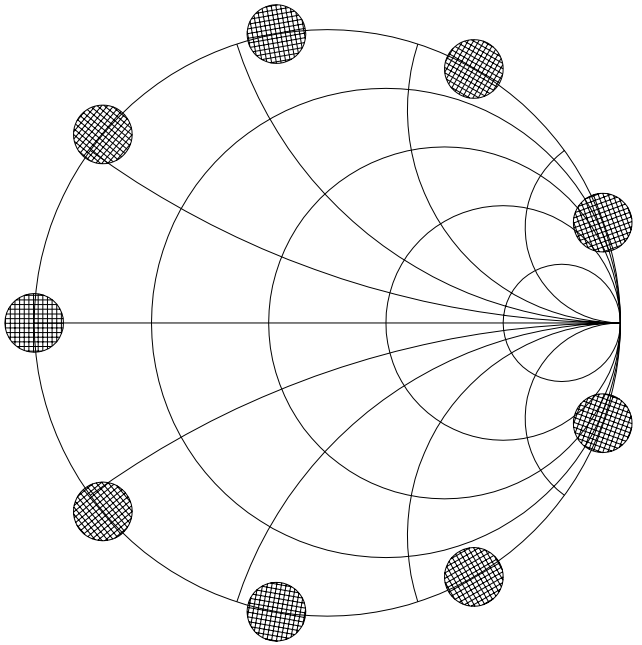


Step of phase changes

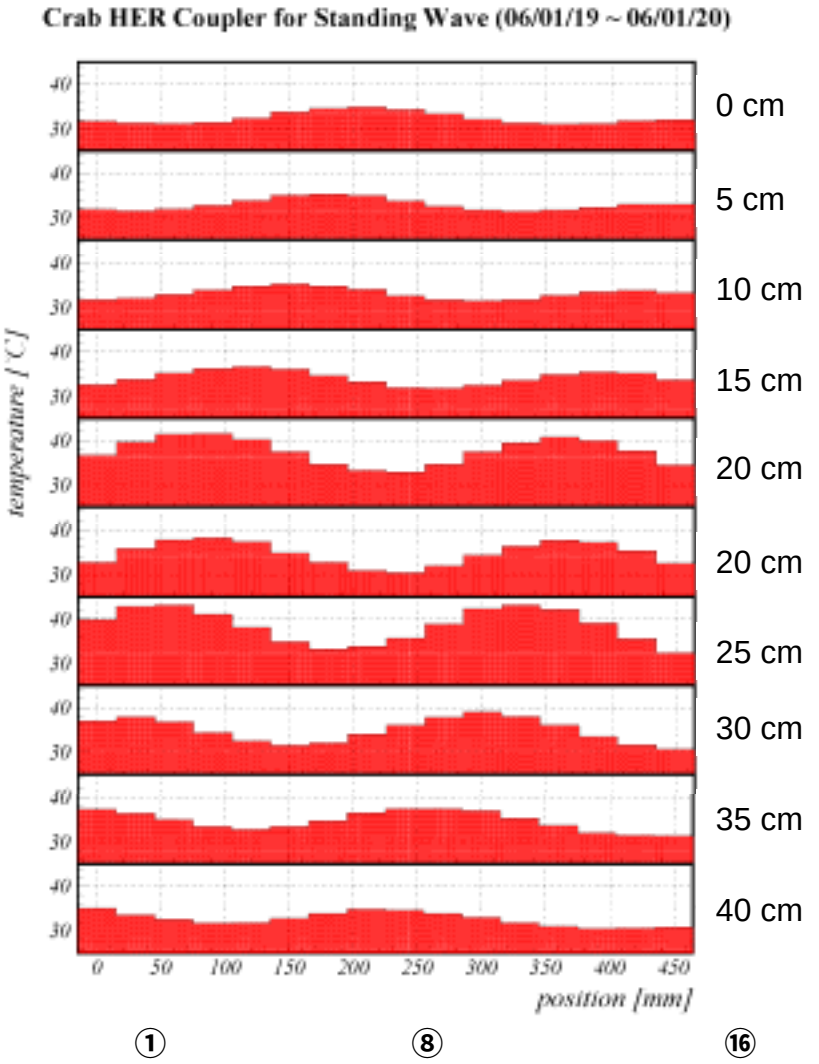
- Wavelength in the waveguide = 92.6cm

(Standing wave period ~45cm)

- Standing wave aging was done every 5cm.



Thermal distribution

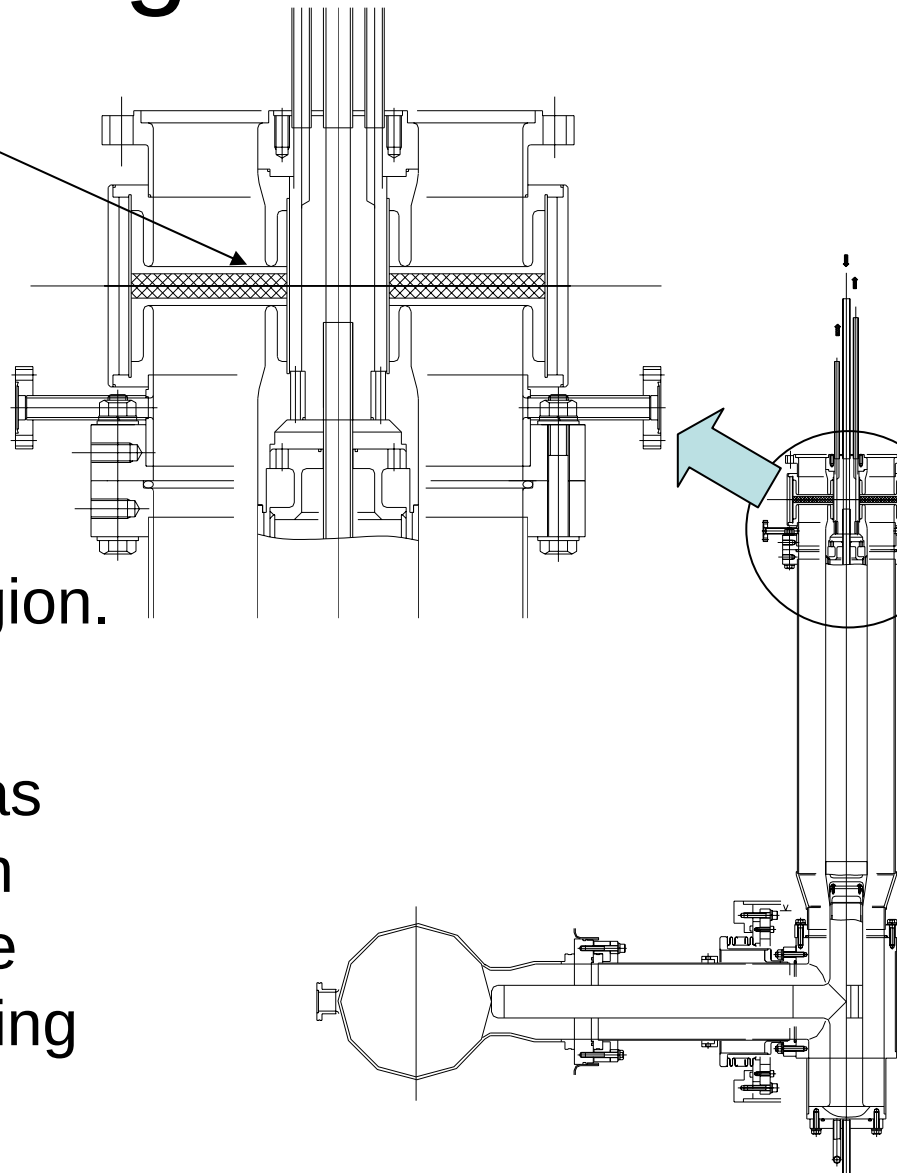


Required time to reach 200kW

Extension of waveguide	Required time (min)	Interlock		
		Arc（crab)	Arc (acc)	Vacuum
0 cm	111	3	1	1
5 cm	5	0	0	0
10 cm	10	0	0	1
15 cm	84	2	1	3
20 cm	31	0	0	3
25 cm	12	0	0	0
30 cm	12	0	0	0

Total time is about 4.5 hours

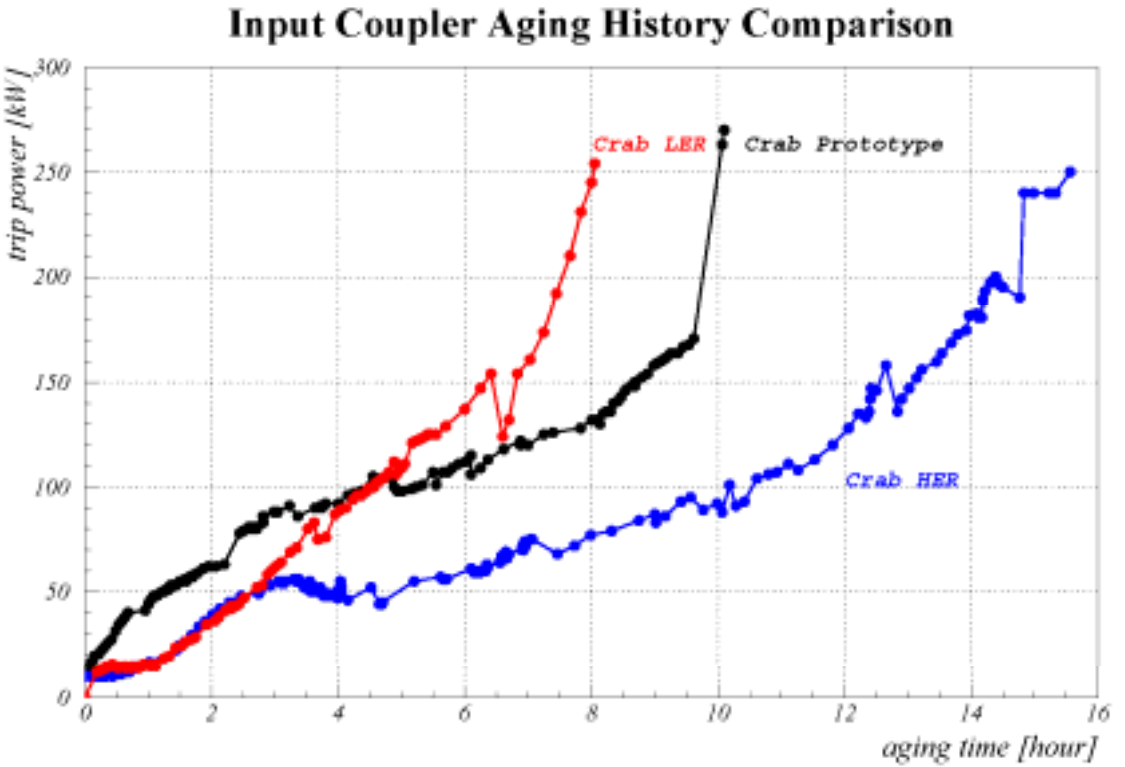
Discharge



Discharge was occurred at air region.
Spilled cooling water caused it.

The power level to be reached was changed from 200kW to 100kW in standing wave aging, because the discharge can’t be detected at aging stand.

Result of traveling wave aging



summary

- Traveling wave aging was done. (200kW)
- Standing wave aging was done. (100kW)

- It was confirmed that the input coupler can be handled 200kW RF power at standing wave condition.

status

- Prototype and HER couplers had been installed.
- The LER coupler is waiting.