



# **Hardware status of ATF**



ATF2 project meeting 2018/11/20  
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## ***Items***

- 1. Beam storage condition and the down time statics  
in Autumn operation***
- 2. Repair broken devices and improvement work  
during Summer shutdown***
- 3. Hardware improvements in near future***

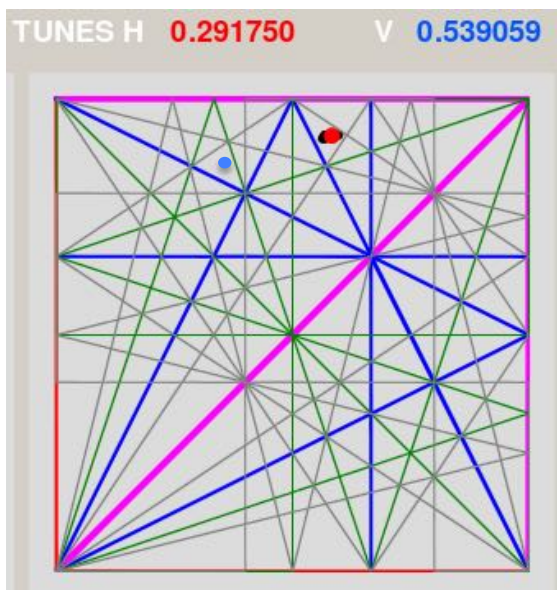
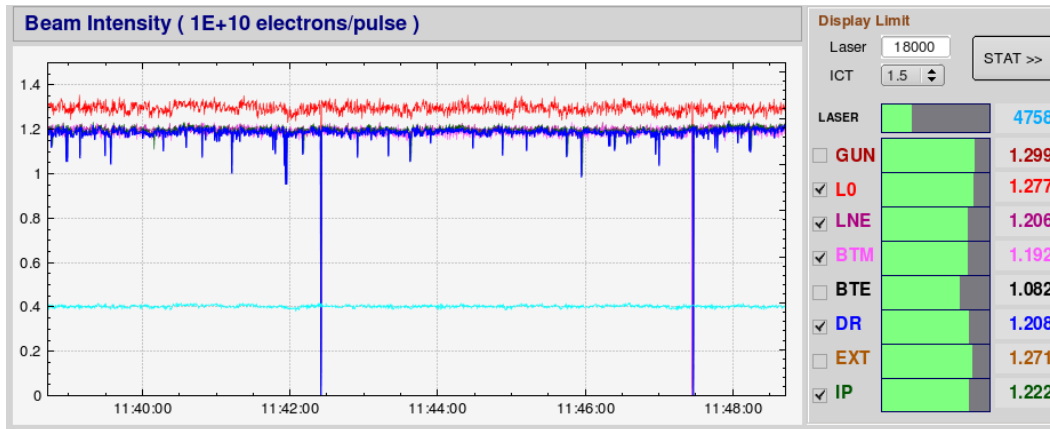


# Beam storage condition and the down time statics in Autumn operation(1)



We could operate up to  $1.2e10$  electrons of a high intensity beam.

Same intensity of two bunch  
Vertical emittance  $\sim 10\text{pm}$



1) The operation point of the DR was changed from

$$v_x = 0.1810, v_y = 0.5588$$

to

$$\underline{v_x = 0.2917, v_y = 0.5390.}$$

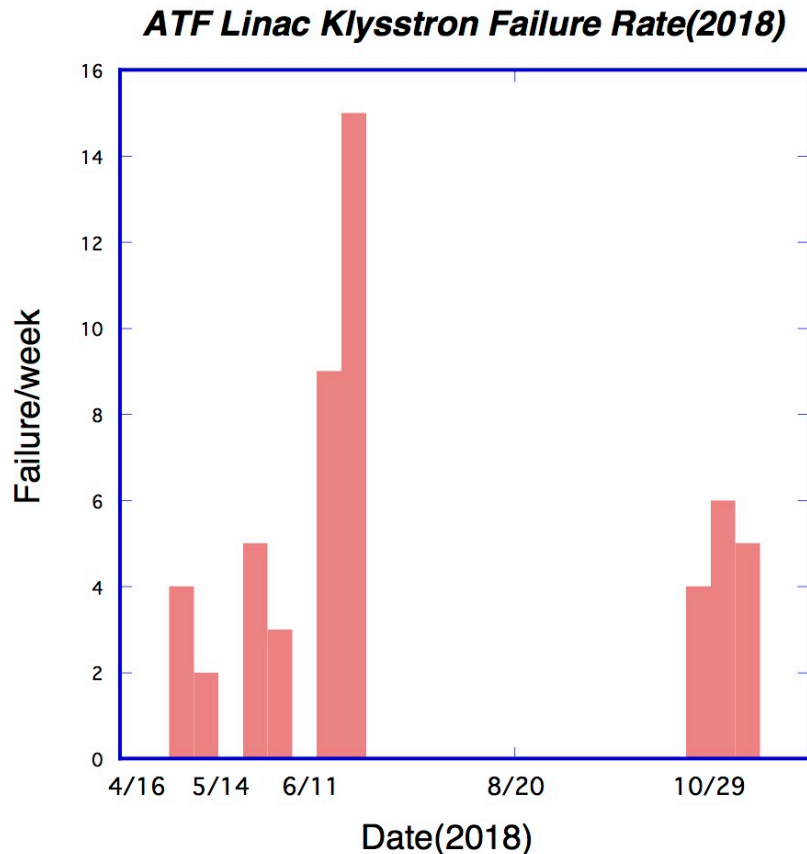
2) Stabilization of the linac



## ***Beam storage condition and the down time statics in Autumn operation(2)***



*Most of the down time comes from the Linac klystron HV interlock, which happened one or two times/day. The beam operation have to wait 10~20 minutes every time for checking of the interlock and the recovery.*



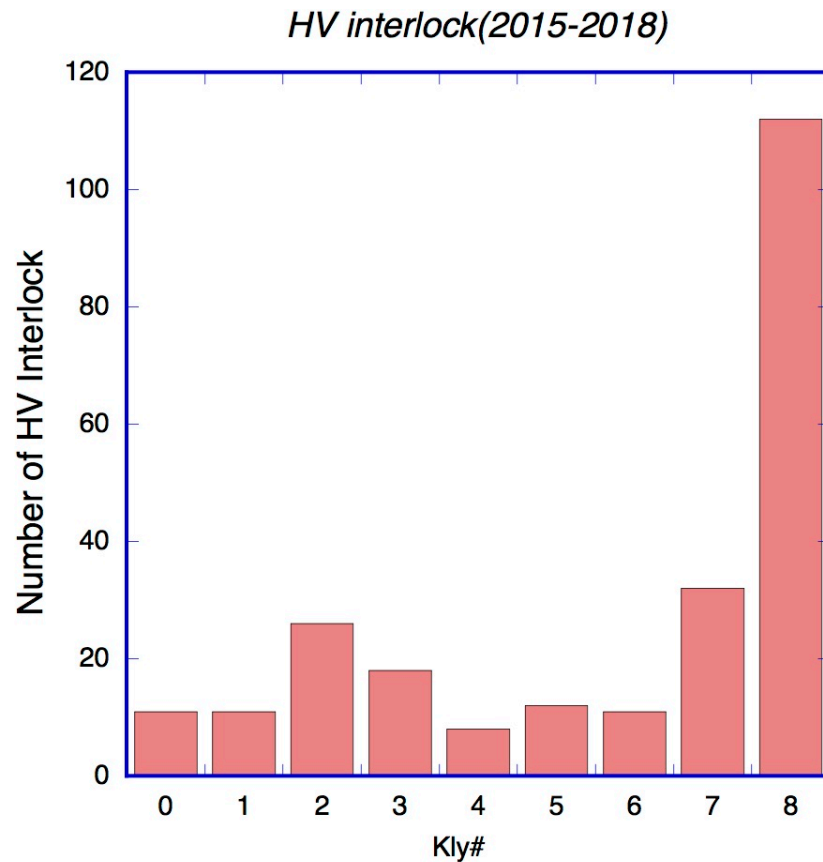
*There are many reasons of the klystron HV interlock, for example, discharge at SLED, discharge at waveguide, HV power supply failure(TDK-Lambda HV-PS Model\_802), discharge inside of klystron, etc.*



## Beam storage condition and the down time statics in Autumn operation(3)



#8 klystron happened the HV interlock many times compare to the other klystrons.



60% of the HV interlock comes from the #8 klystron discharge.

We inspected the reason of the #8 HV interlock. We concluded the discharge happened at the inside of the klystron, which means near the end of life.

The HV interlock rate is not so increase during three years.



# Repair and improvement work during Summer shutdown(1)



## Repair

1. Beam trigger module of the linac beam had a large jitter and some times jumped the timing. -> Replaced to new one.
2. AVRs(Auto voltage Regulator) for the Linac thyatron heater and reservoir power supply showed unstable output voltages(10~20% reduced from the specification), which used over 20yers.  
-> Repaired



AVR for  
thyatron  
switch



## **Repair and improvement work during Summer shutdown(2)**

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### *Improvements*

- 1. A chiller to make the cooling water for the DR RF cavity is located at Nakanoshima. The temperature stability was 1degreeC and the chiller makes a mechanical vibration at Nakanoshima. -> LUCX cooling water (deionized water) delivers to the DR RF cavity. The stability of the temperature is +/-0.1degreeC. This work was completed this week.*
- 2. The cooling water for the Damping Ring klystron room air conditioner was used an old cooling tower, which was very poor cooling ability. -> LUCX cooling water(15degreeC) delivers to the klystron room.*
- 3. Old CAMAC serial high way modules some times made communication errors. -> The serial high way was replaced to local IOCs using RaspberryPi. We are using ~60 CAMAC crates. 10 IOCs were installed and the residual IOCs will be installed during winter shutdown.*





# Repair and improvement work during Summer shutdown(3)



*A chiller to make cooled water for RF Cavity located at Nakanoshima (15kW)*





# Repair and improvement work during Summer shutdown(4)



Air  
Conditioner  
for Klystron

DR  
Klystron

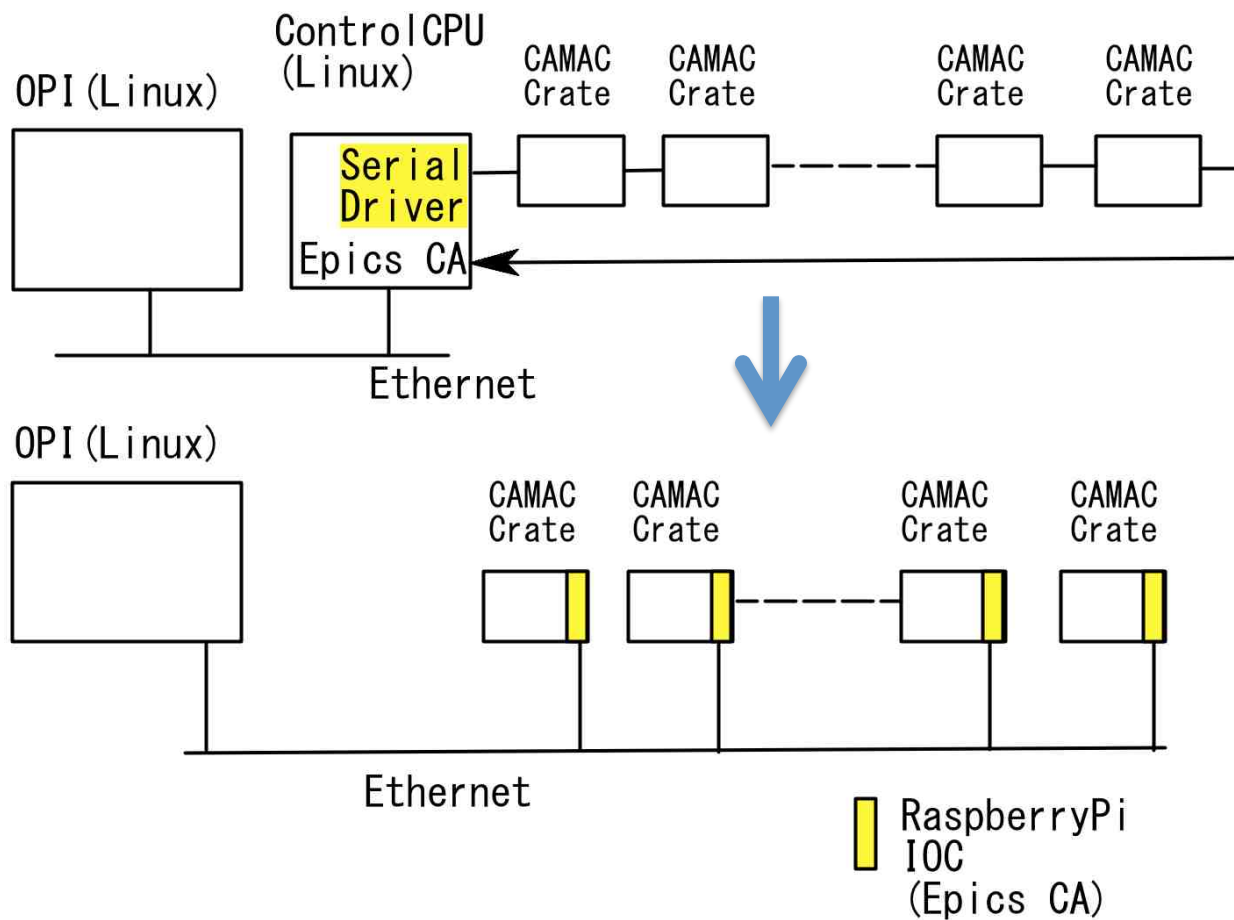




# Repair and improvement work during Summer shutdown(5)

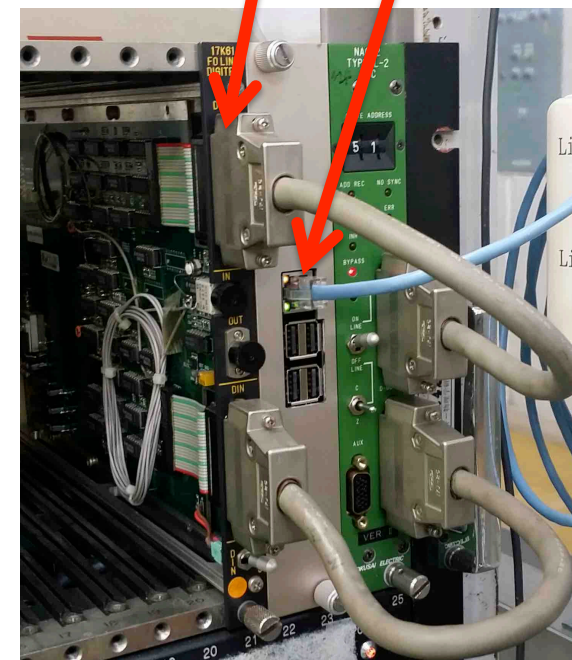


## ATF control system



Serial Highway Optical Link used as Crate controller driver.

Rpi IOC





## Hardware improvements in near future

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1. Air conditioning system of the DR tunnel is renewal.  
-> Jan/2019 or February/2019  
*The temperature stability will be improved after renewal.  
The orbit drift of ATF2 beam line comes from the temperature change of the DR tunnel will be improved.*
2. CAMAC control IOCs using RaspberryPi is installed for all CMAC crates. -> Jan/2019  
*The CAMAC control problem will be cured completely.*
3. 16bit ADC for DR current monitor will be replaced to new one.  
-> Jan/2019  
*The reading mistake of the DR current will be cured.*
4. We have no spare the linac klystron. The linac uses 11 klystrons.  
#0~#8 are Toshiba3712 and #9 and #10 are SLAC5045.  
We not yet keep the budget for the spare klystron(¥25Myen)



## Summary



- 1. We could operate up to  $1.2e10$  electrons of a high intensity beam. The new operation point of the DR and the stabilization of the linac components were effective.*
- 2. Improvement work to stabilize the ATF2 beam is on going, the temperature stabilize of the DR tunnel, the cooling water for the RF cavity, etc.*
- 3. We need budget to reduce the down time of the ATF. #8 klystron should be replace to new one in near future.*