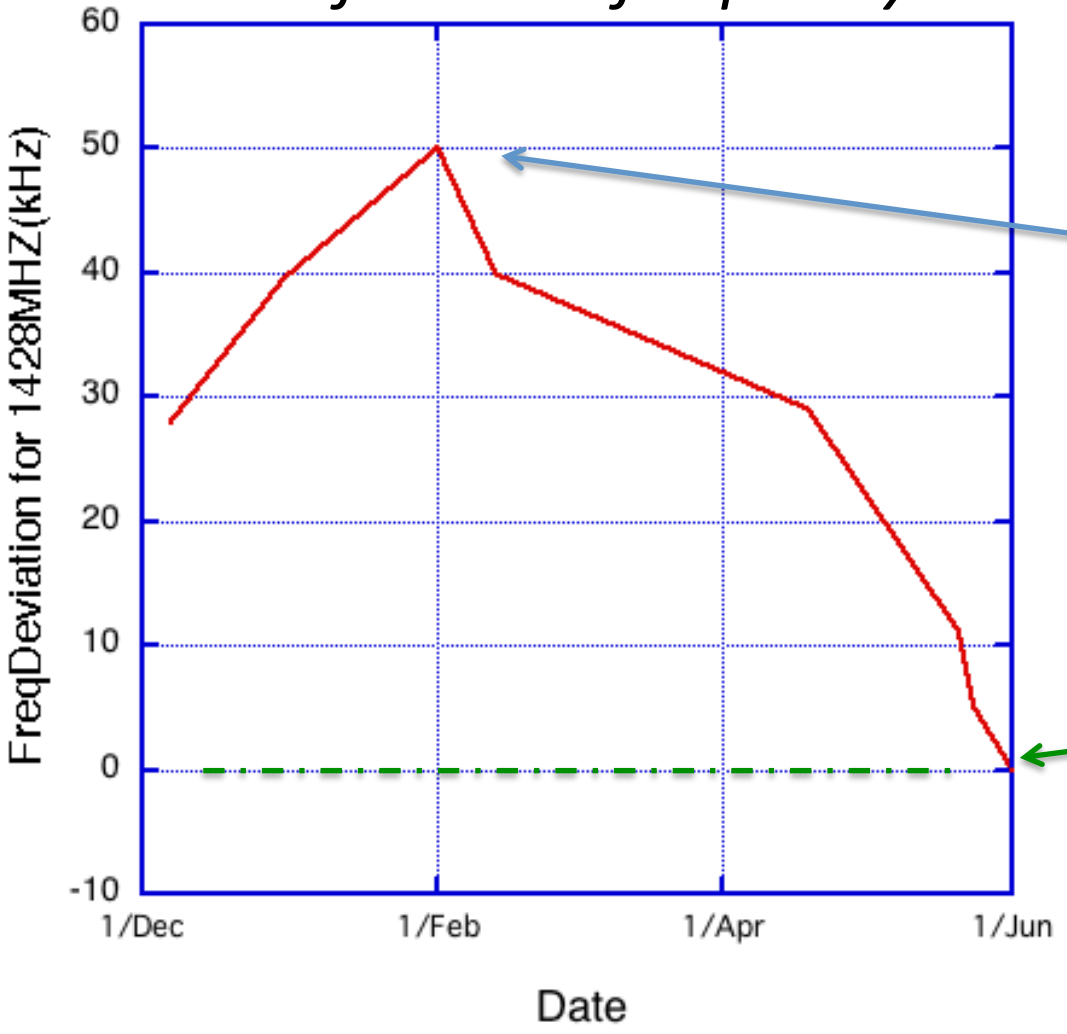
# *Variation of DR circumference and 3Hz operation*

20120626 ATF2 Project Meeting T.Naito

*Circumference change from 2011/12/07-6/15*

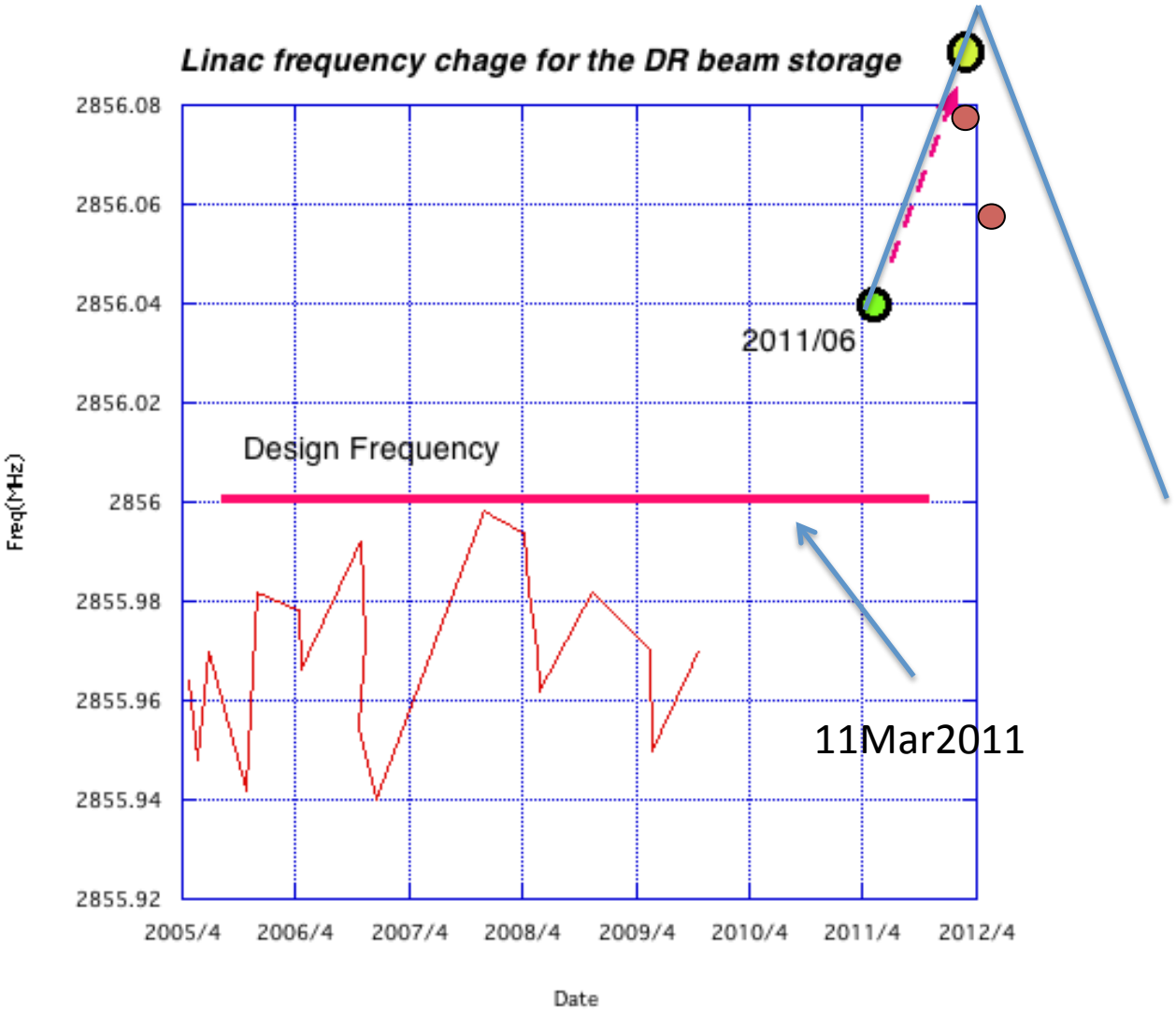
*Estimated from the frequency change of the DR-RF*



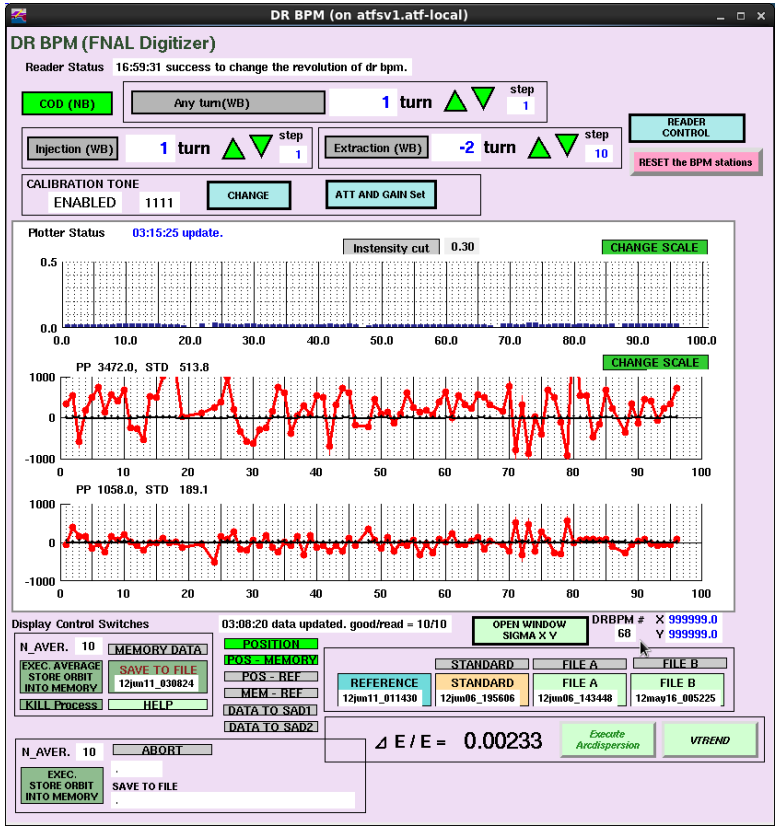

(50kHz/1428MHz)*138m
=~5mm
5mm/138m=$3.6\times10^{-5}$

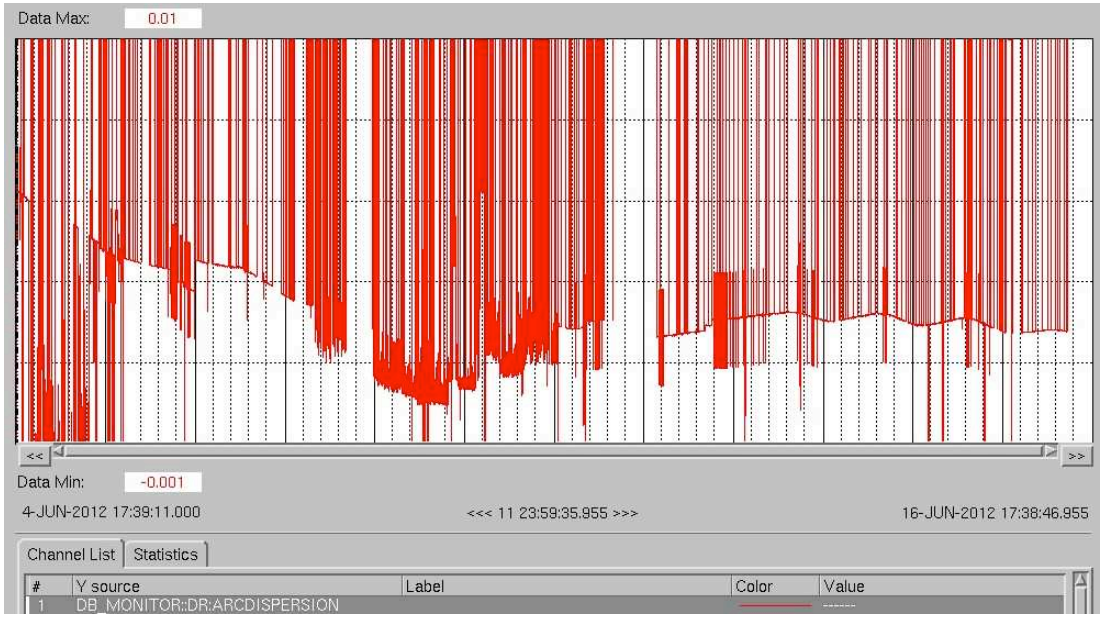
Design Frequency
1428MHz
(Twice of 714MHz RF
Frequency)

# *Trend of the ATF frequency change f (2005 – 2012)*



# *Circumference change of the ATF-DR*



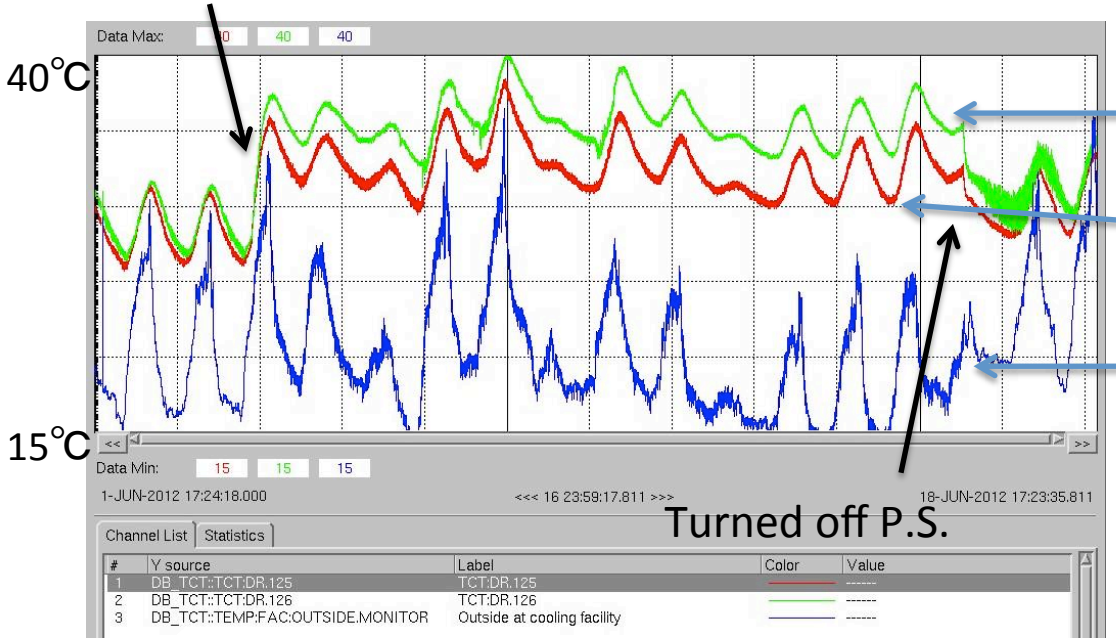




Arc Dispersion change (6/4~6/16)

The DR circumference changes day by day. Especially, the circumference expands gradually in the first week of the operation.

# *Temperature of the DR*

Turned on P.S.

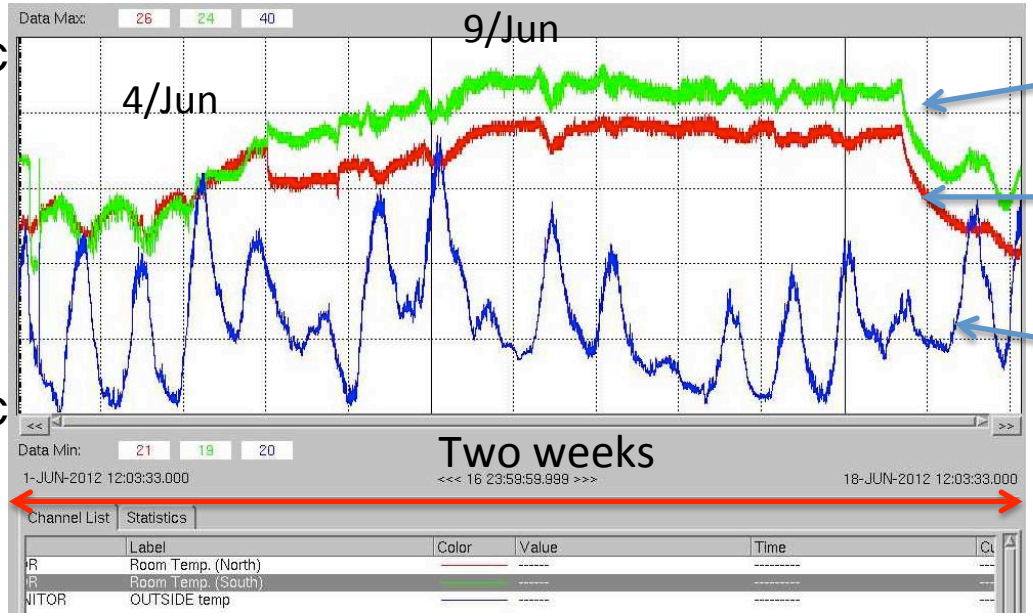



DR-Nakanoshima East Temp.

DR-Nakanoshima West Temp.

Out side Temp.

Turned off P.S.




DR-South Tunnel Temp.

DR-North Tunnel Temp.

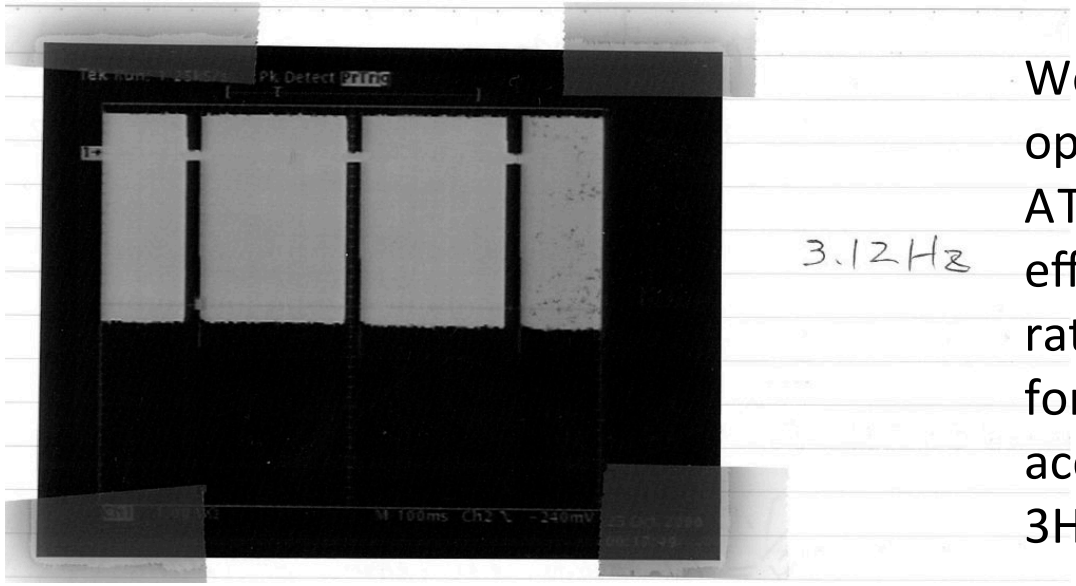
Out side Temp.

# Cooling system of the Magnet P.S.


The magnet power supplies are cooled by the outside air. This system is an inexpensive system, but the temperature depends on the outside temperature.

If the circumference change is so serious, we have to consider the other cooling system.

# 3Hz operation

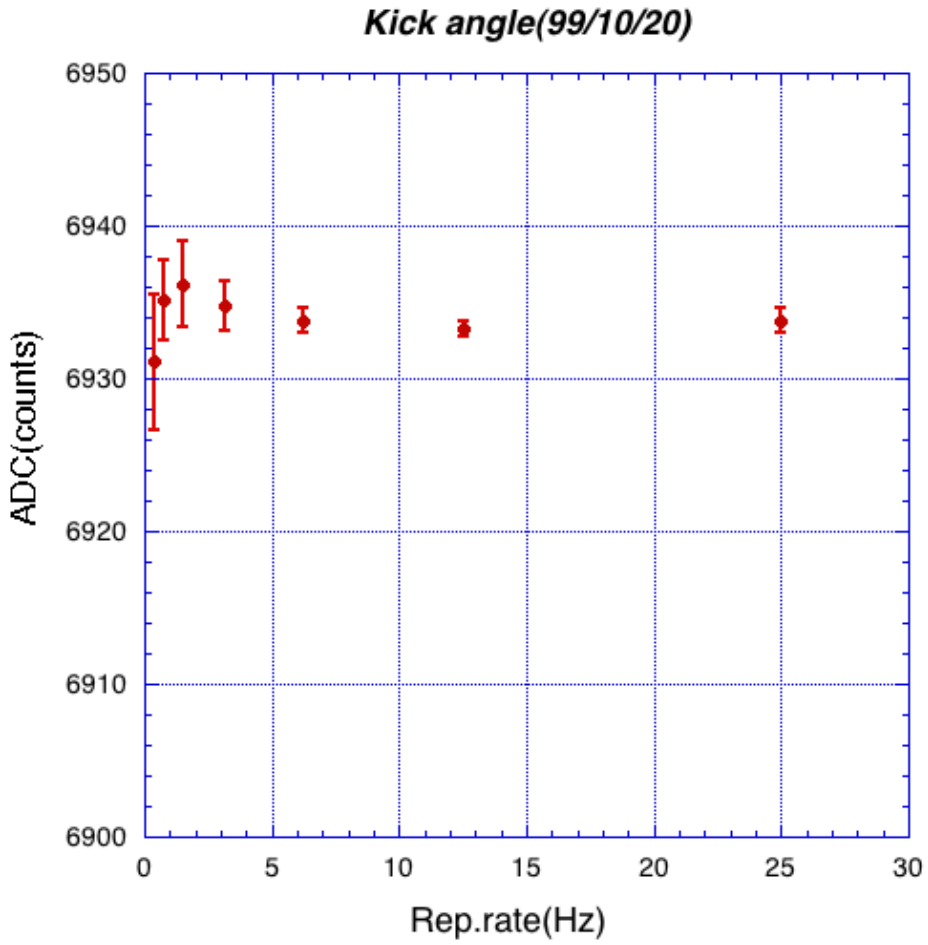



2000/10/24

We have an experience of 3Hz operation from the early time of the ATF operation. There was not efficient increasing the repetition rate for the poor computing power, for example, the shot by shot data acquisition could not be realized at 3Hz operation.

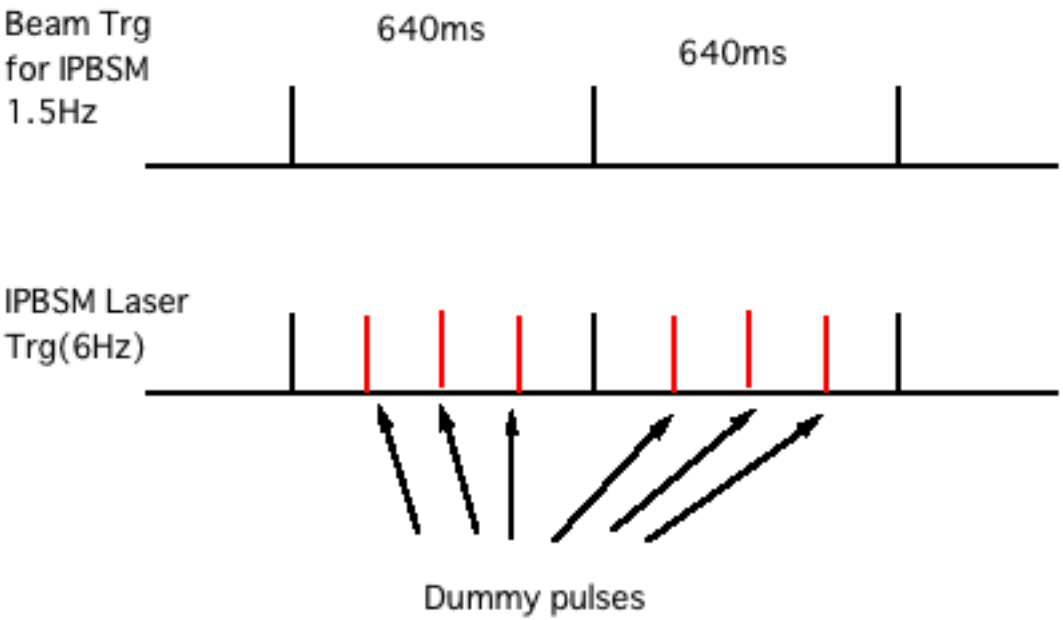
- Linac OK
- Radiation OK
- Kicker – need to the kick angle adjustment
- DR-BPM - need to check the timing
- IPBSM Laser trigger(6Hz) – need to modification

# 3Hz operation of the Kicker



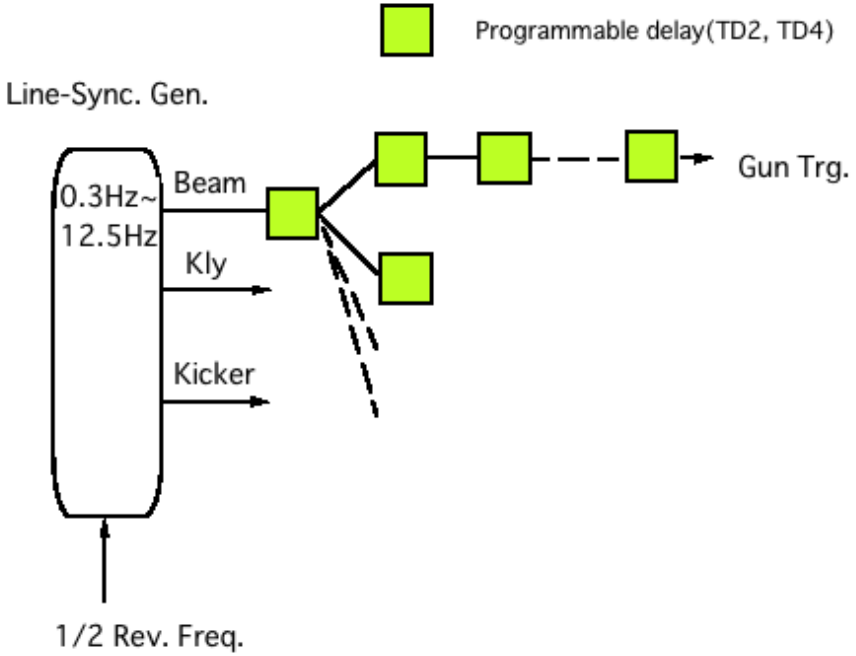

The kick angle is a little bit change. The data shows the small jitter?

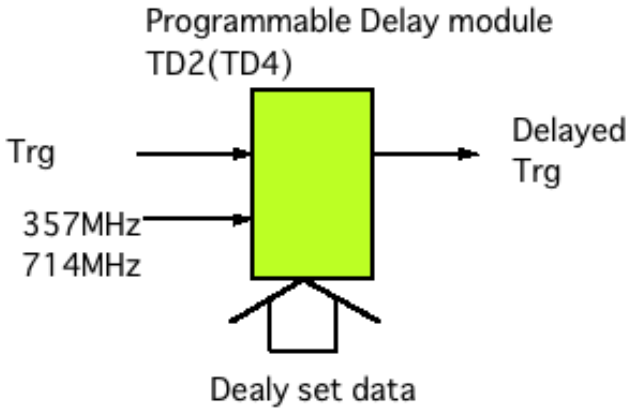
# IPBSM triggers(1/2)



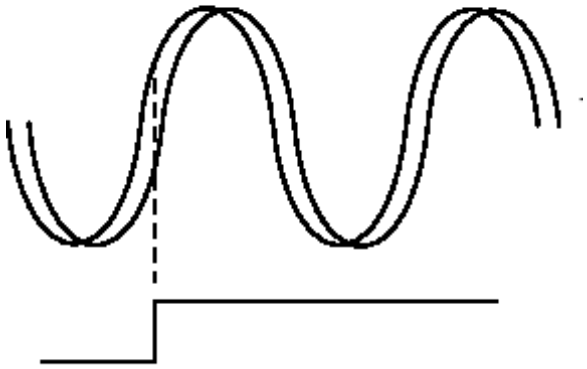

The trigger of the IPBSM Laser(6Hz) is produced from the 1.5Hz beam trigger. The dummy pulses are inserted between the beam trigger. The hardware can not fit the frequency change.

# IPBSM triggers(2/2)



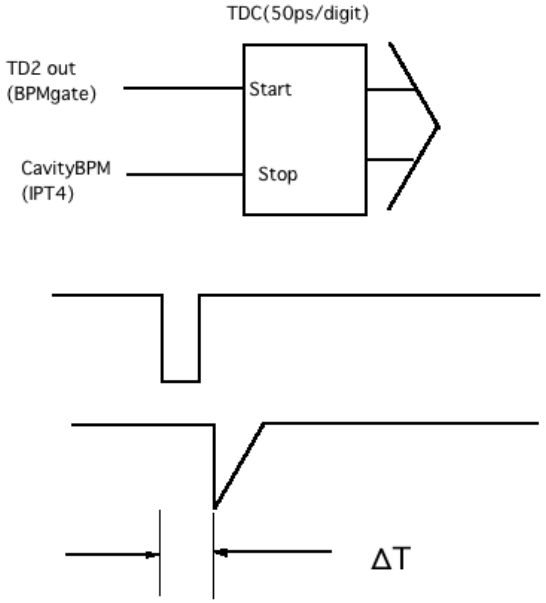




The trigger signals are provided by using the programmable delay module(PDM). The PDM has a 5ps accuracy for the counting clock. Over one hundred of the PDMs are using in the ATF. The problem of multi-connection of PDMs is “one-count error”. When the signal timing between the input trigger and the counting clock is very close, sometimes count one and sometimes count zero.



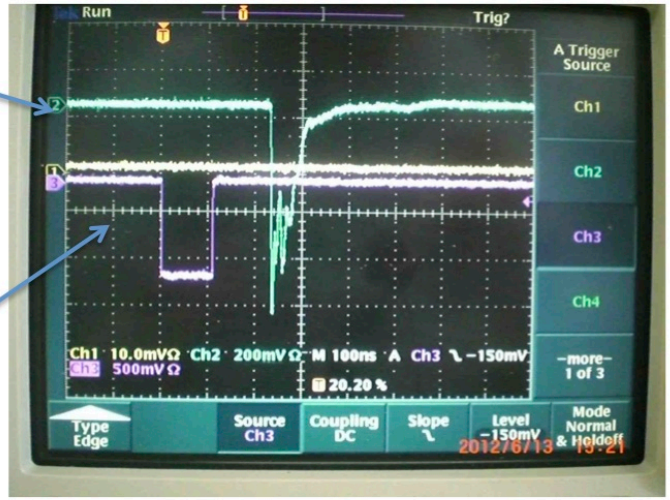
One count error of the PDM

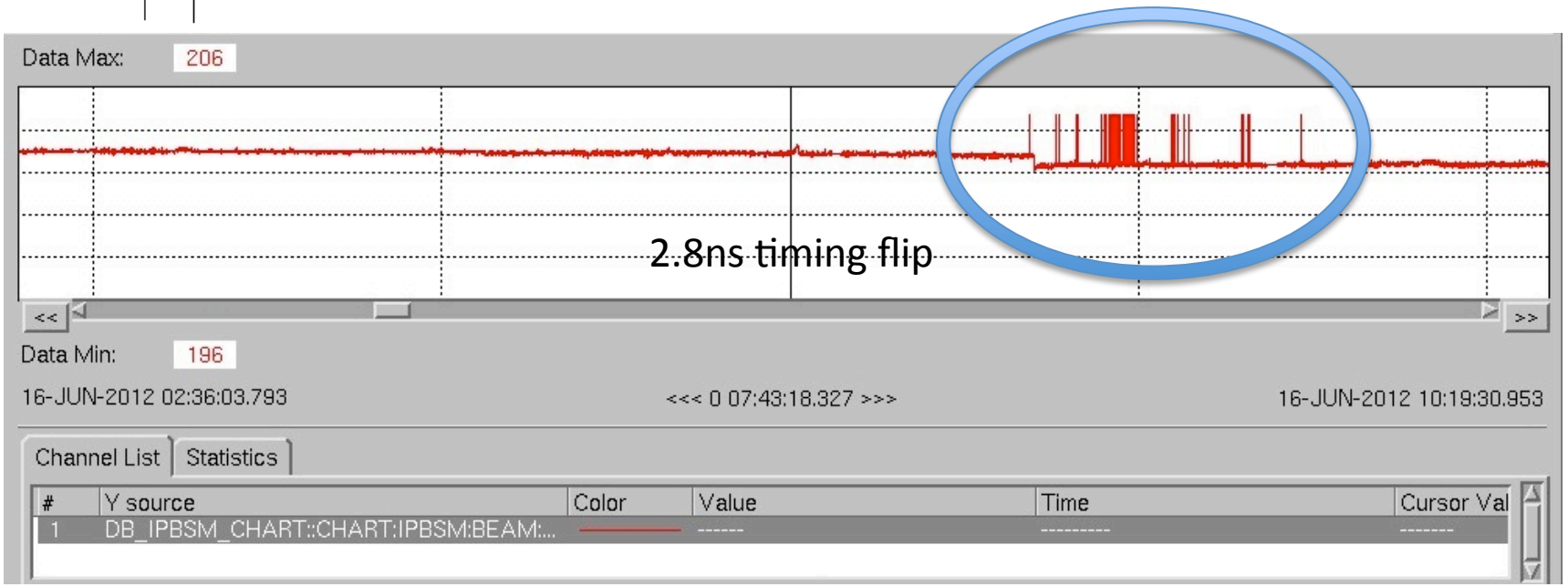
# Timing flip at EXT electronics hat



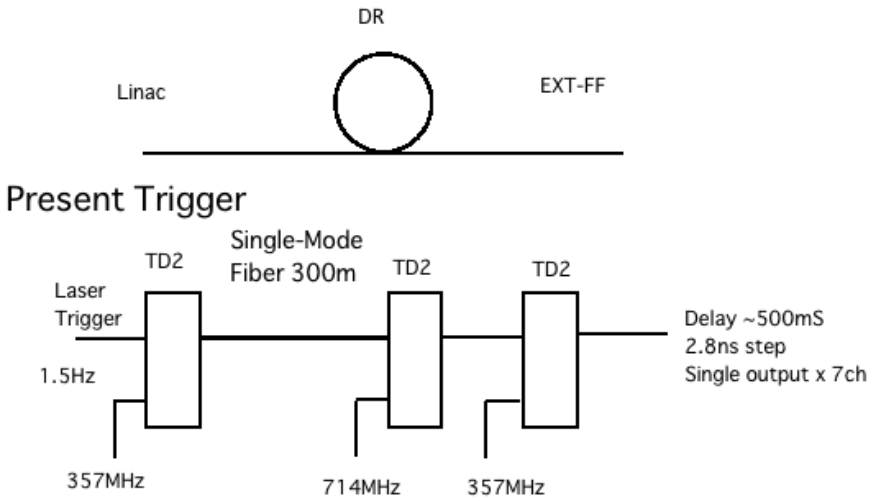

Beam Sig.
CavityBPM
(IPT4)

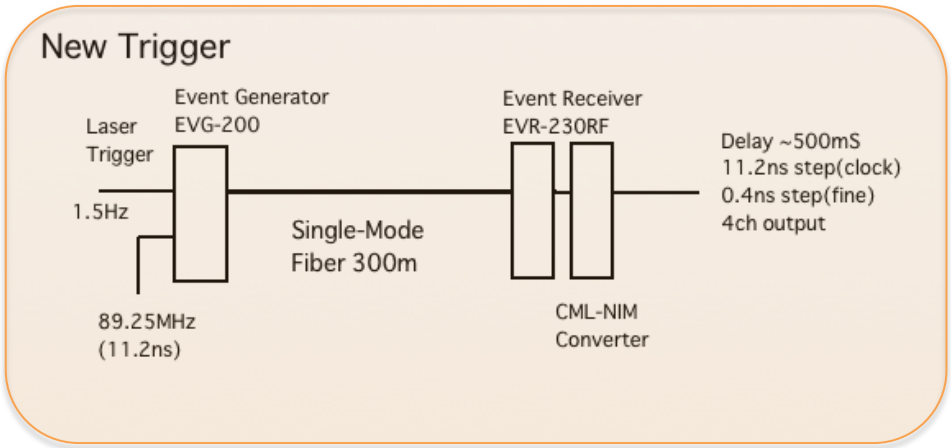
TRIGGER
(TD2)

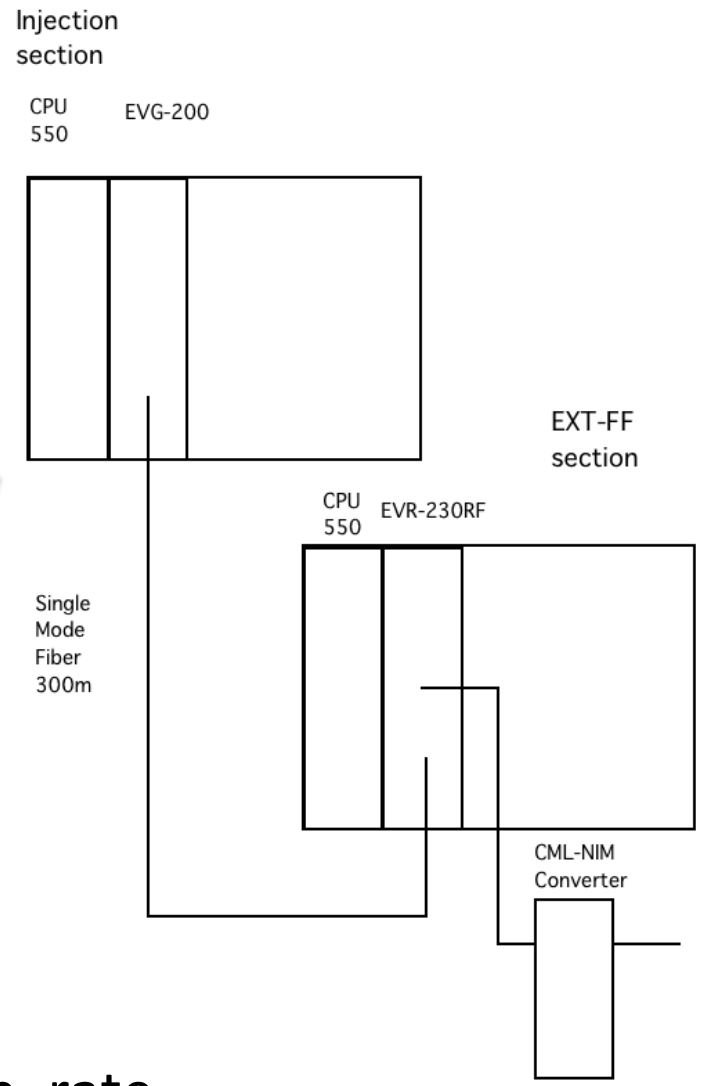


# Modification of the Trigger system



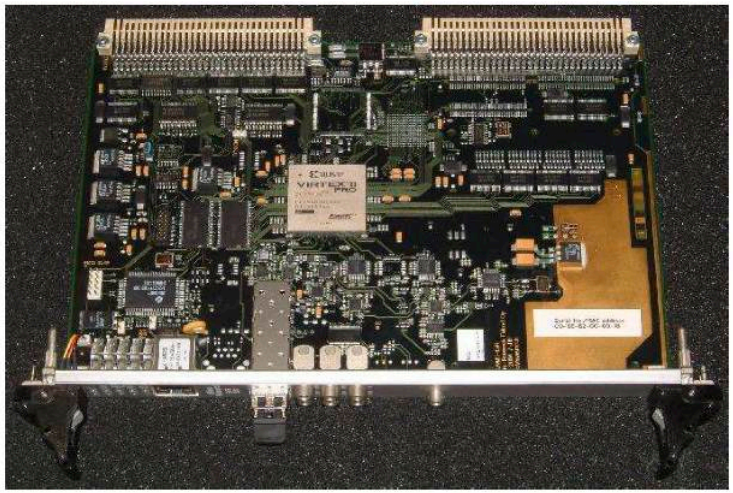




1)No one-count error

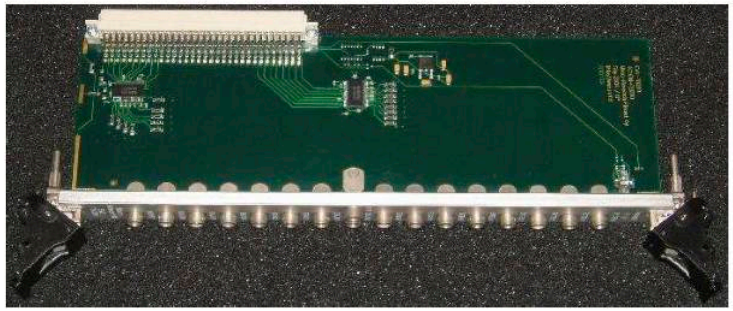
2)Easy to change the rep. rate

# Event Generator EVG-200



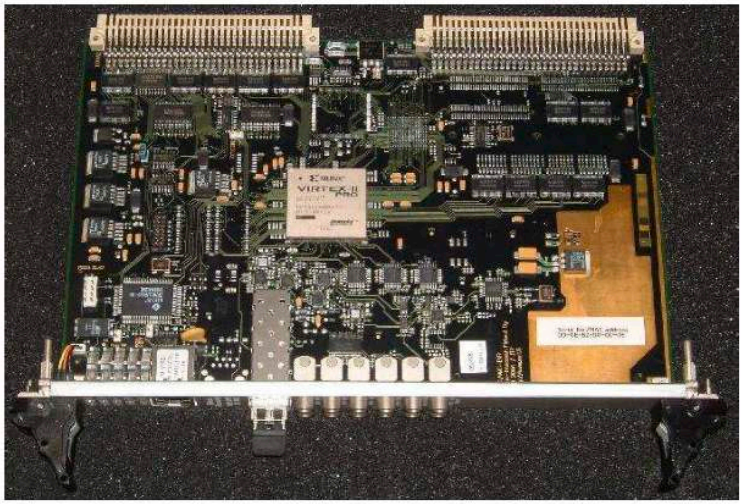
- Event clock rate 50 MHz to 125 MHz
- Transmitted bit rate 1.0 Gbps to 2.5 Gbps
- RF to Event clock dividers /4, /5, /6, /8, /10 and /12
- TTL front panel input for synchronisation e.g. to 50/60 Hz AC line voltage
- 256 Event codes
- 2 Event sequencers
- 8 Distributed bus bits
- 8 Multiplexed counters

# Event Generator Transition Board EVG-TB-200



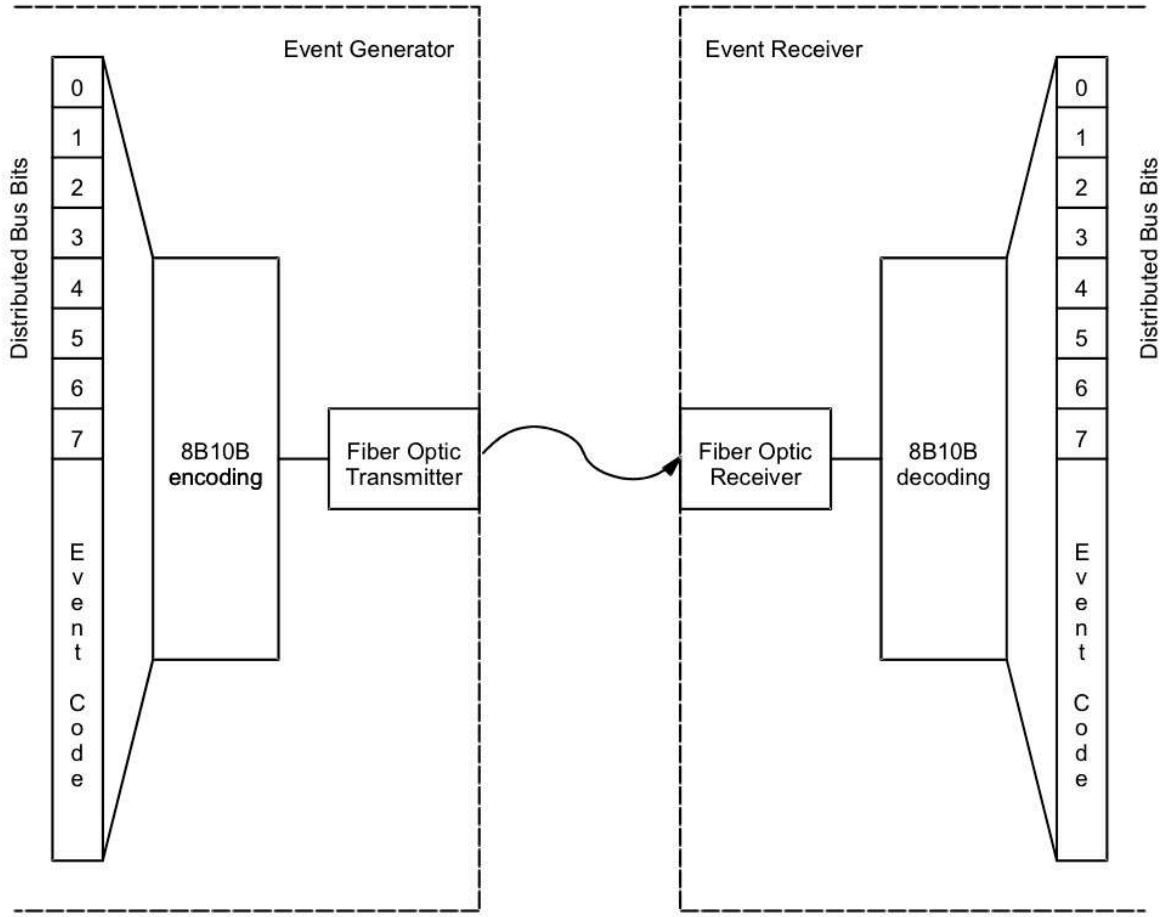
- 8 Trigger event inputs
- 8 Distributed bus inputs
- External reset input

# VME Event Receiver VME-EVR-200 and VME-EVR-RF-200

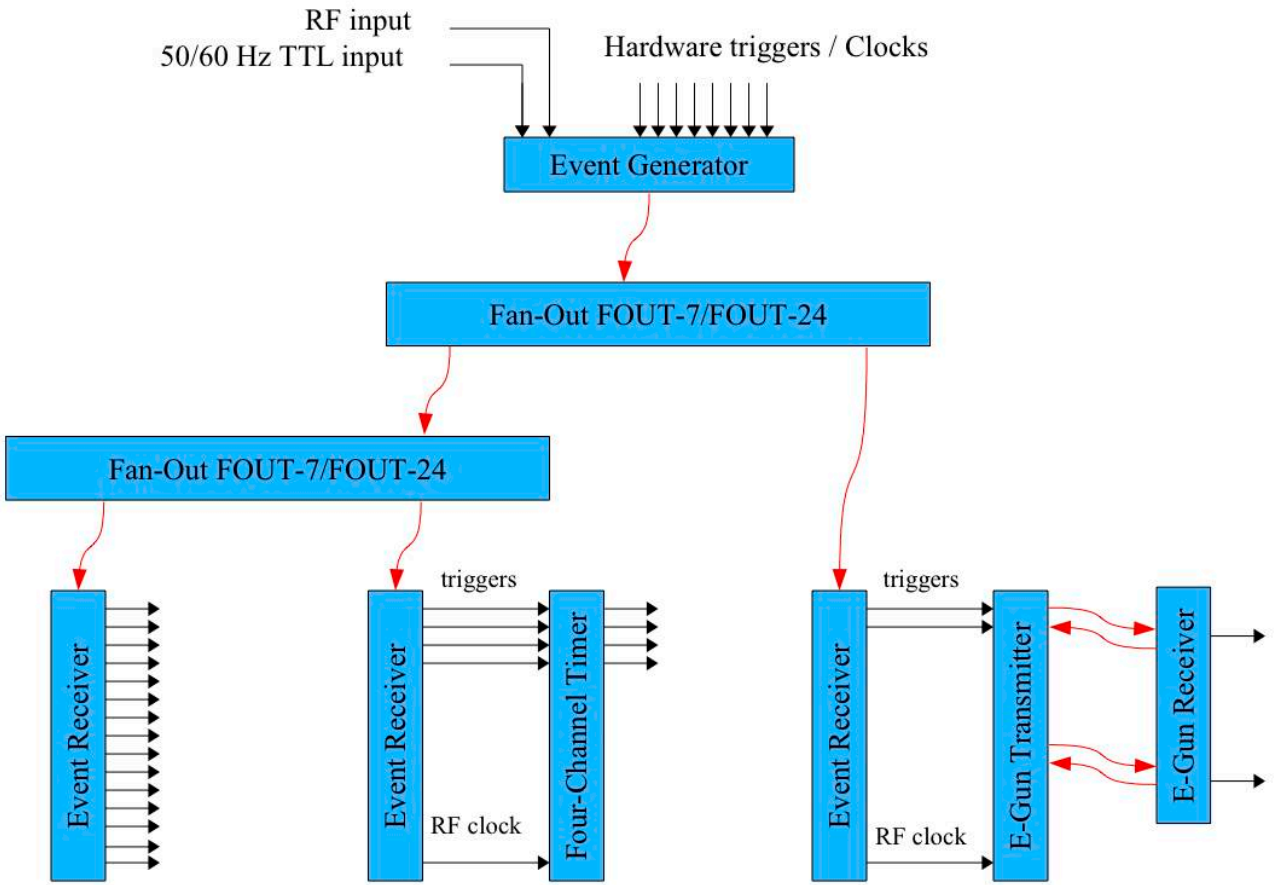


- 32 Hardware outputs through P2:
  - 4 PDP outputs: 32 bit counters for pulse width and delay, 16 bit prescaler
  - 7 TEV Trigger event outputs
  - 14 OTP/8 DBUS outputs: 32 bit counter for pulse delay, 16 bit counter for pulse width
  - 7 OTL Level outputs
- RF clock recovery (VME-EVR-RF-200)
  - 20 bit pattern repeated with event clock rate
- 7 programmable front panel outputs: 5 TTL, 2 differential LVPECL
- Timestamping with 32 bit seconds counter and 32 bit fast counter (up to event clock rate)
- Event FIFO for storing events with timestamp
- Front panel external event trigger input

# Event System Frame Structure



# Timing Event System Overview



# Summary

- The DR circumference change (~5mm/year) was observed, which comes from the temperature change of the accelerator hall.
- To increase the efficiency of the ATF2 experiment, 3Hz operation is planned. There is no significant problem for 3Hz operation. The trigger circuit modification is needed for easy repetition rate change.