

# **DAQ status and TODO**

**RHICf meeting, April 4-5, 2017, Nagoya**

# To do in 2016-Oct

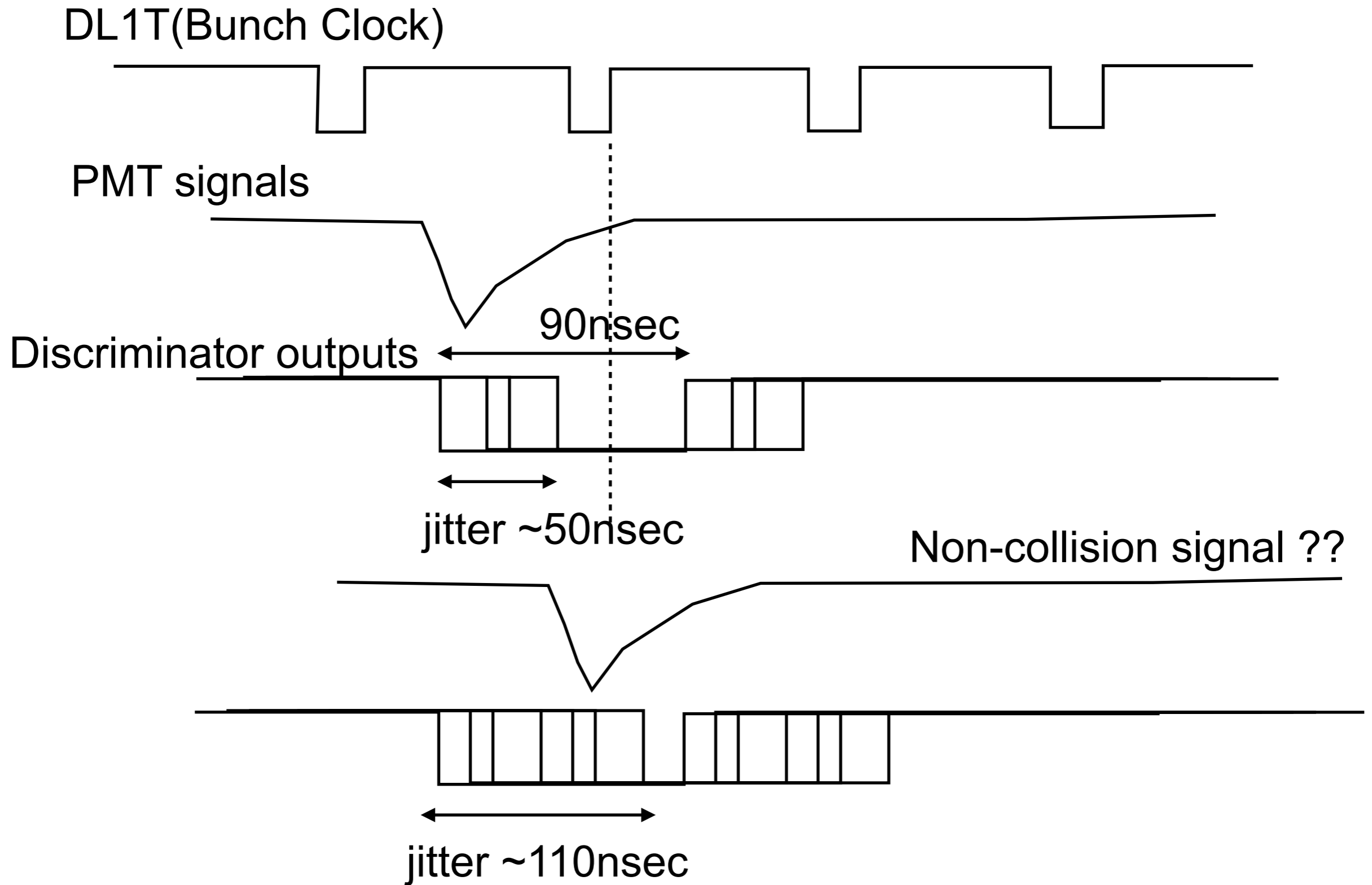
## DAQ

- FPGA logic (Zhou, sato)
  - Detail checks of trigger modes, counters and flags (Nov.)(Feb, Sato)
  - ~~Additional counters for each bunch ID. (Nov.→Feb, Zhou, Menjo)DONE in Feb».~~
  - ~~Modification of Trigger detection with FIFO (Feb.,Sato)DONE in Feb.~~
- Site preparation (Sako)
  - ~~Rack (STAR)~~
  - ~~Support structure of the patch panel (BNC-Lemo) (Nov.) DONE in Nov.~~
  - ~~Network configuration under the STAR DAQ network. (Nov.) DONE in Nov.~~
  - Measurement of noise and optimization of discriminator threshold. (Nov.)
- Operation condition
  - Fix the H.V. configuration
  - Operation plan
- Software works of MIDAS system (Nov., Junsang, Minho)
  - Frontend: Dummy event generator
  - Modification of analyzer
  - Modification and confirmation with Tonko (un control and analyzer)
  - Setup of Event Display
- Common operation with STAR
  - Communication test with STAR (Nov., Menjo, zhou)
  - Determination of most probable latency from collision to trigger production
  - Turning of latency with beams (Jan-Mar)
  - On-line monitoring on the STAR system. (Nakagawa, Minho)
  - Quick asymmetry analysis (Nakagawa, Minho)
- Slow-Control (Mar.)
  - Monitoring tool for Keithley (temperature) (Junsang)
  - Monitoring tool for CAEN mainframe (H.V. and L.V.)
- Others
  - Attenuators for USB oscilloscope (Nakagawa)
  - Modification of the LED module for increasing light amount. (Nov, Nakagawa & Minho)
  - Test with LED by the MIDAS system (Nov., Zhou, Sato, Minho)
  - Special module V124 for getting RHIC beam information (Goto)
  - Offset adjustment of preamp and FANOUT (Sako)
  - ~~Length of coaxial cables and resistance of DC power cables~~ DONE on 3 Nov.

# Status (RHICf standalone)

- Since Nov. 2016
  - Upgrade of FPGA logic **DONE**
    - Implementation of Dummy orbit signal (Dummy Bunch-ID).
    - Counters of shower-trigger signals for each Bunch-ID.
    - Programable dummy trigger generator.
  - Modification of the frontend software. **DONE**
  - Tuning of trigger signals **Panically done**  
-> See the next slide.
  - FEC problem
  - LED setup **Panically done**
  - Slow Control **Panically done**
    - Control and Monitor of the Keithley module for measurement of temperatures and setup of MAPMT H.V.
  - Optimization of FANOUT offsets. **DONE**

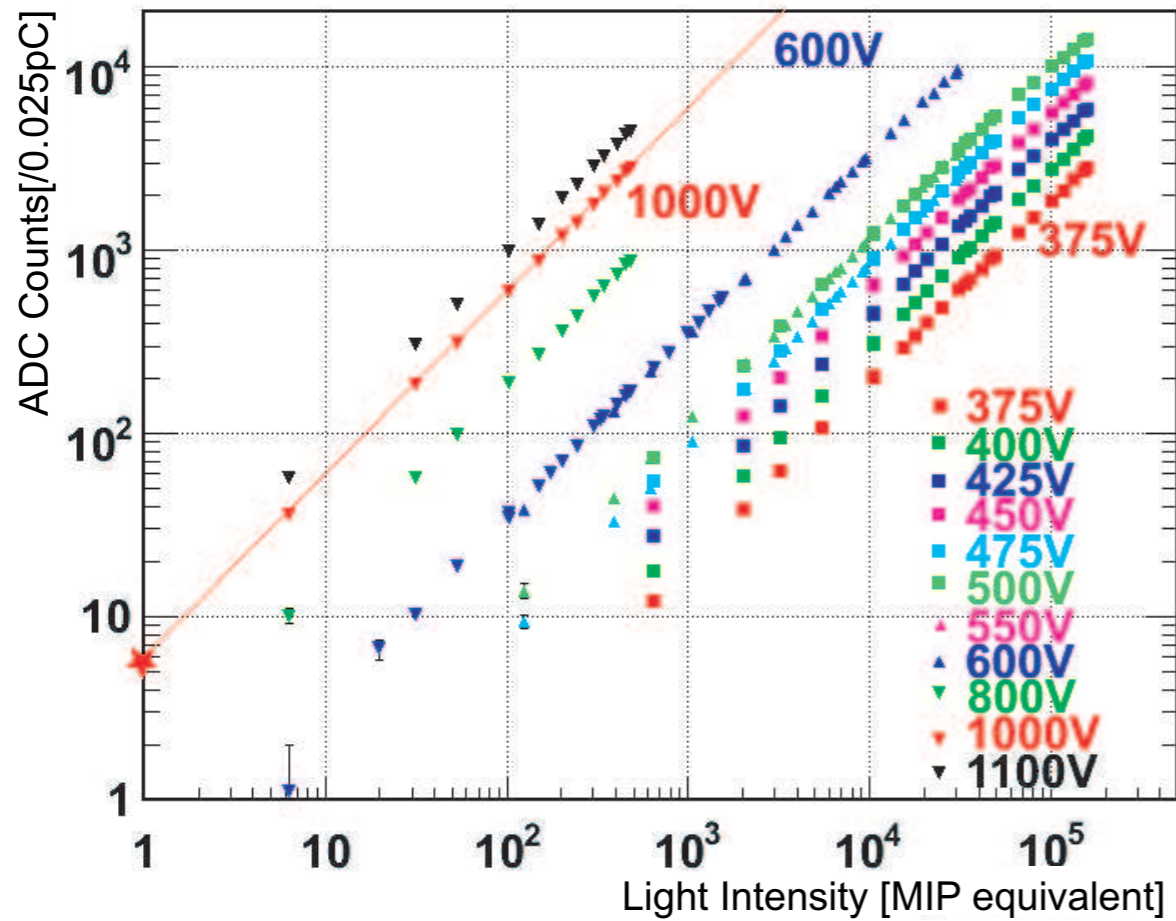
# Tuning of trigger signals.



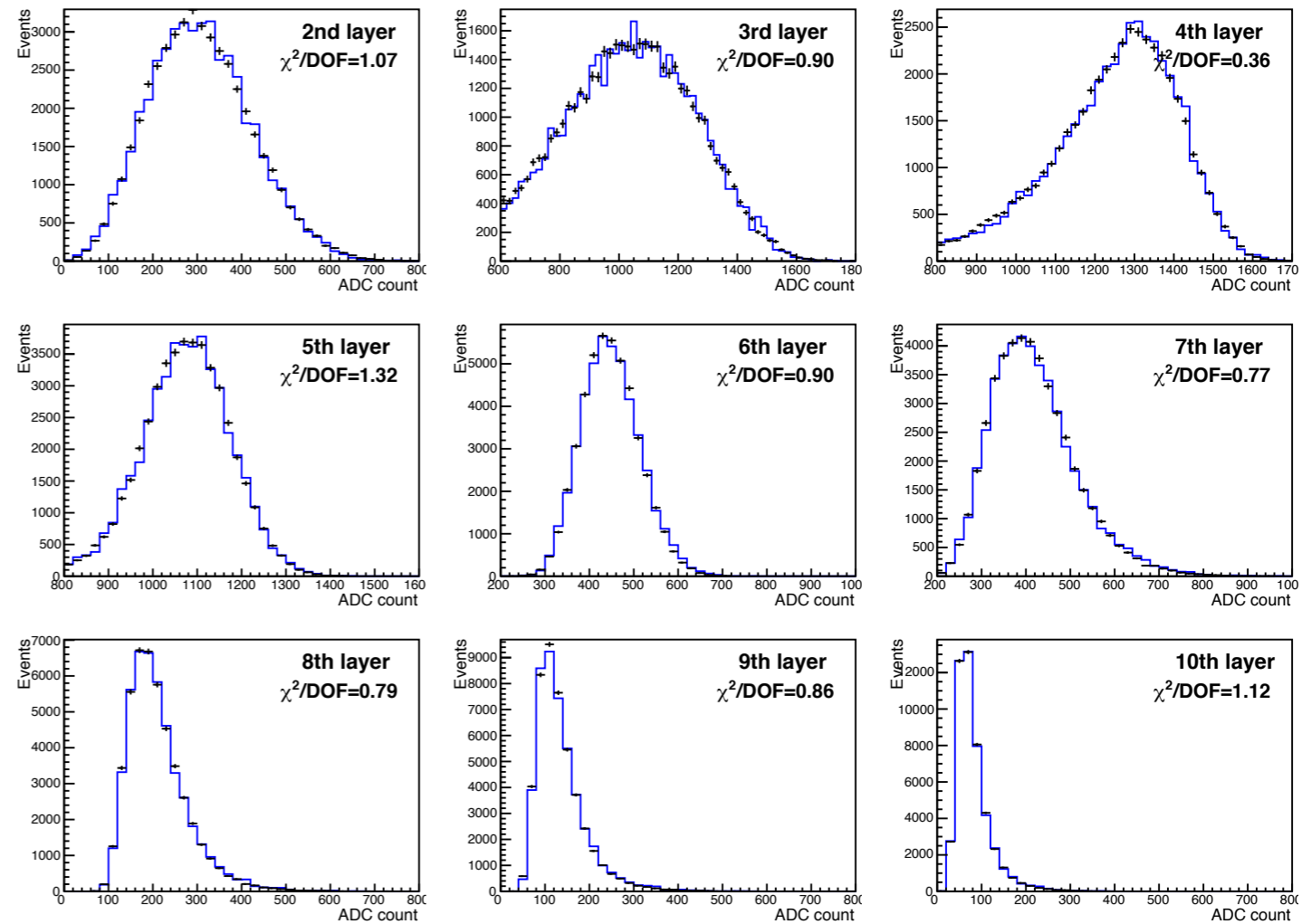
# To-Do for RHICf standalone

- Complete remaining homework.
  - Tuning of trigger signals.
  - SlowControl system
    - Logger of CAEN power supply.
    - Control of the CAEN power supply.
- Define the operation conditions
  - Threshold of the discriminators  
Input: Trigger rate by electric noise.
  - H.V. of PMTs and MAPMTs  
Input: the HV-gain tables and the requirement of trigger efficiency.
  - Trigger mode  
Input: Required statistics for physics cases.
- On-line/Off-line monitor system.

# HV and Threshold



## Energy deposit for 200GeV e<sup>-</sup>



Discriminator Threshold = 10 (-20mV)  
 -> ~ 200 ADC counts

# Trigger mode

## ■ Possible trigger modes

Only three trigger modes can be implemented due to the limitation of FPGA logic.

- Shower trigger
- $\pi^0$  type 1 enriched trigger
  - Shower in 1-7 layers
  - Two towers coincidence.
- High energy EM trigger
  - Increase the discriminator threshold of one of the layers
- Large tower trigger

MC simulation studies are needed for estimate the performance and the rate.

# DAQ for common operation

- Since Nov. 2016
  - Upgrade the FPGA logic. **DONE**
    - Implement FIFO for managing non-RHICf token signals.
  - Tuning signals for common operation. **DONE**
    - Delay in RHICf trigger signals
    - Tune for token recode in RHICf DAQ
  - Software preparation for sending RHICf data. **DONE**
    - Implementation of Analyzer\_ToStar.
  - Common operation test with STAR. **DONE**
    - Control RHICf run start/stop from the STAR DAQ.
  - Read the RHICf data stored in the STAR disk. **DONE**

**Ready to take data with STAR**



# To-Do for common operation.

## ■ To-Do

### □ Define the operation mode with STAR.

- Proposed plan by STAR

- 1. RHICf triggers with diffractive trigger in STAR (~100Hz)

- > Recode STAR TPC

- 2. RHICf triggers (the others)

- > Not recode TPC

- 3. Non-RHICf trigger (~1.2 kHz)

- > No Token is distributed to RHICf.

=> Operation of STAR with the DAQ-full bandwidth will include 10% dead time in STAR DAQ. So 10% of RHICf triggers will not be recoded in STAR.

→ Simple pre-scaling down of RHICf trigger

### □ On-line/Off-line monitors for event matching between RHICf and STAR.

- By header information,

- Token, bunch ID, and counters(BC counter reseted by STAR run start).

- By physics values, exp. correlation between RHICf and ZDC/BBC

# Others

- Debug of Scaler signals in STAR
  - We send some signals to STAR. They are counted in STAR DAQ with combining with the bunch-ID information.
  - We sent 3 signals+empty in 4 lines.  
We saw counts in all “4” channels.
- Remote control of a oscilloscope.
  - Install a laptop for controlling it by USB connection.