SC-ECAL-J Status

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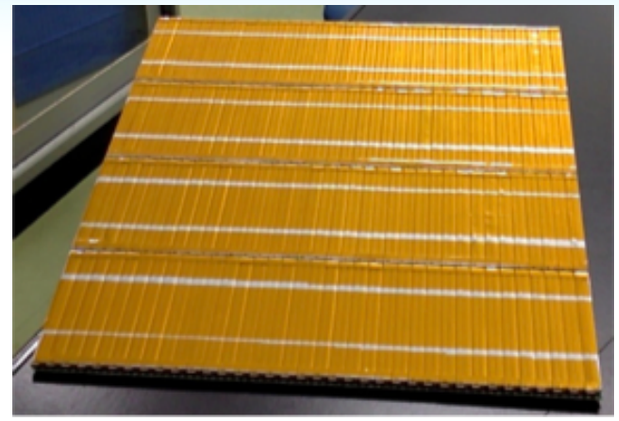
CALICE meeting 2019@CERN

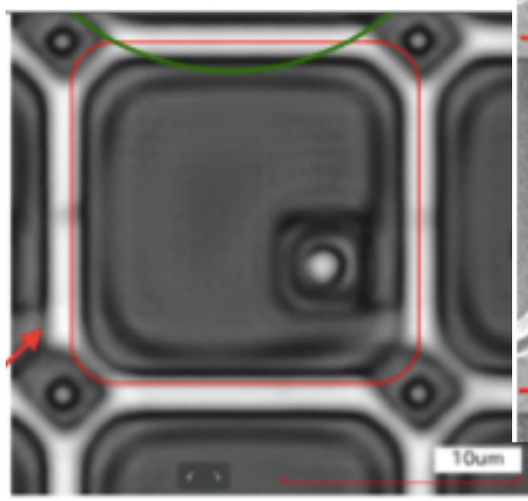
scintillator-ECAL act.

- EBU
- photo-sensor MPPC
  - 15um and10um pitch
    - new model with trench
    - saturation :> Tsuji
- scintillator strip study
  - strips with dimple
  - double read out :> Masuda

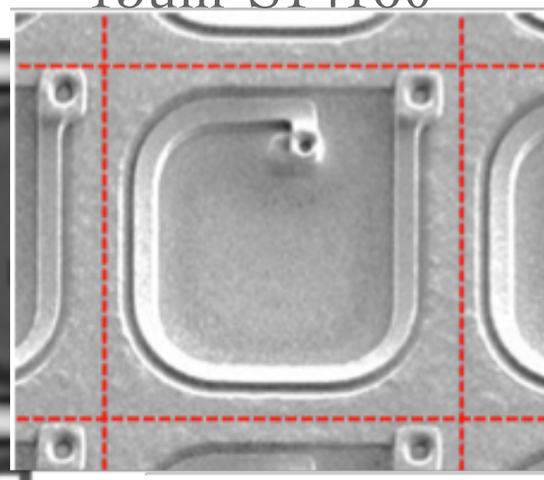
15um-S12571

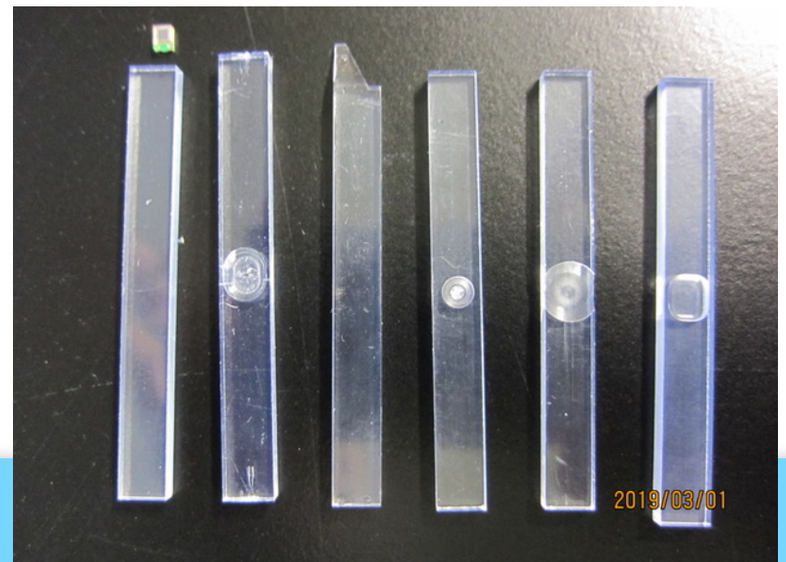


15um-S14160



S14160





45mm

90mm

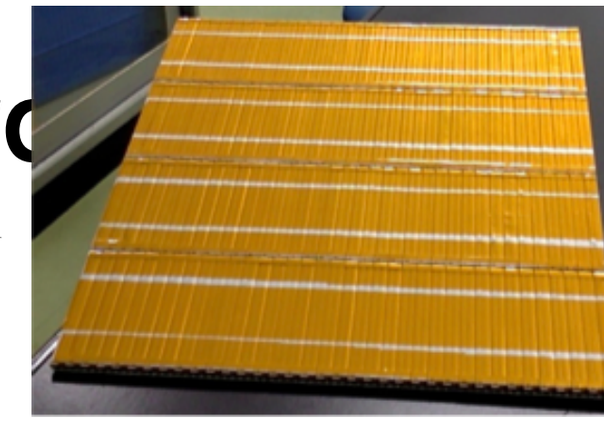
EBU

18cm

18cm

- ECAL Base Board made by DESY
- 4 SPIROC2b's of Omega on board for 144ch

18cm



18cm

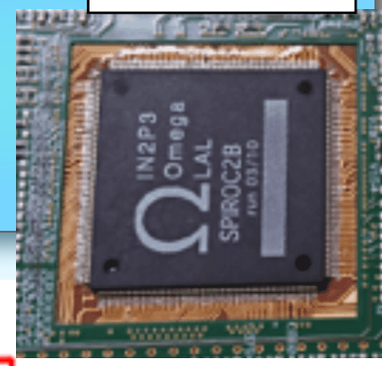
- SPIROC is designed for 25um pitch photo-sensor, we're employing 10/15 um pitch MPPC

increase number of pixels for dynamic range

- signal is smaller due to pixel size

SPIROC2b

SPIROC2b



- memory cells : cells
- cell No. dependence
- pedestal

a channel

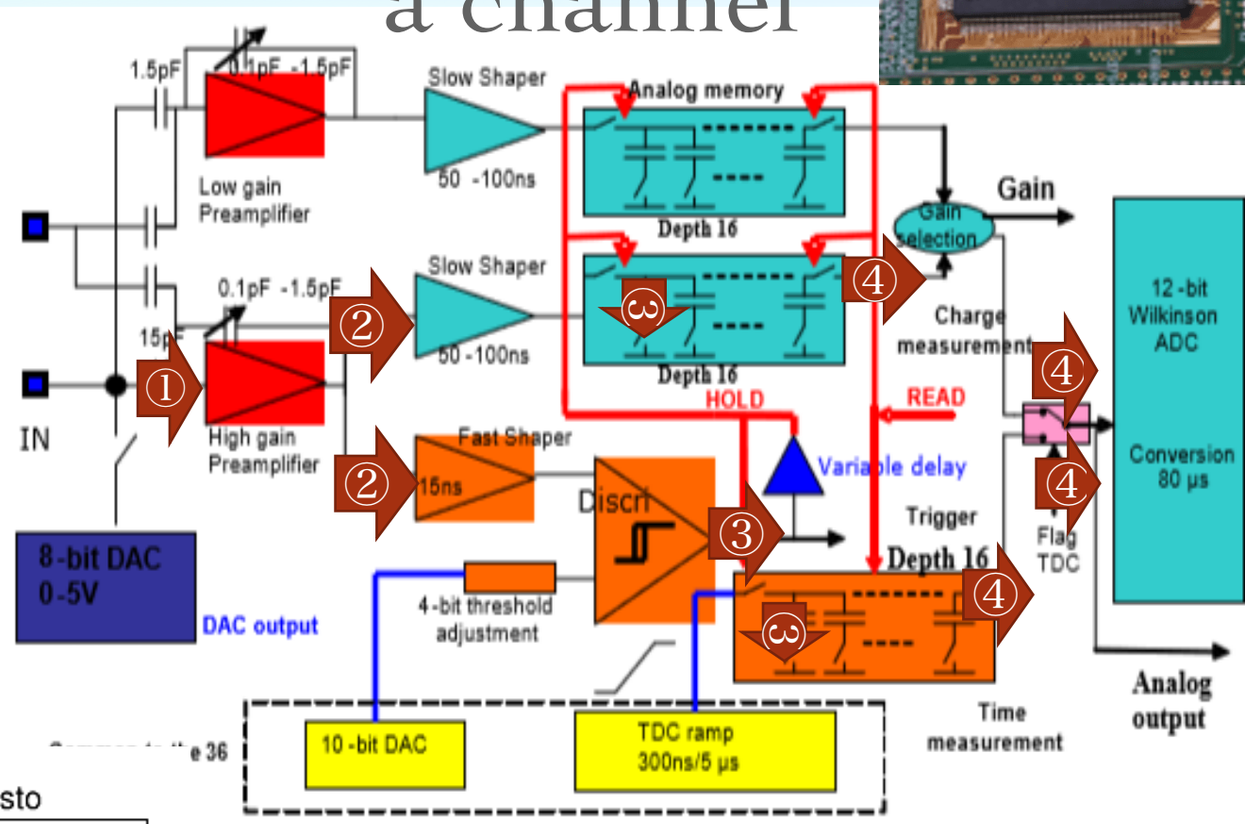
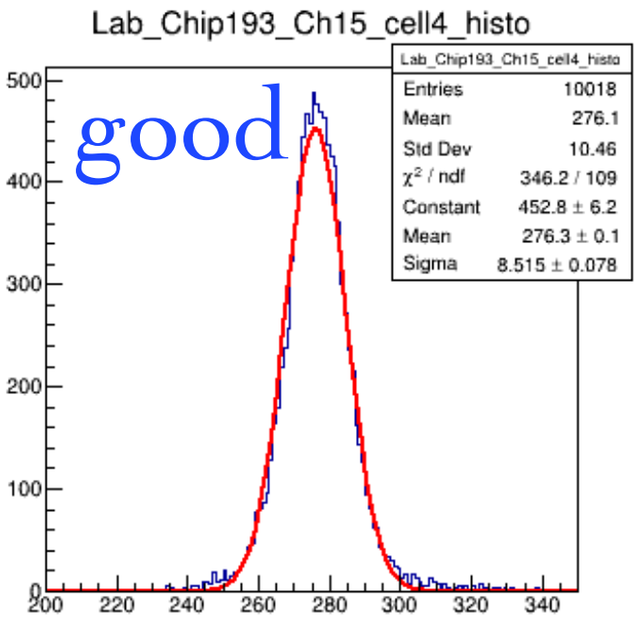
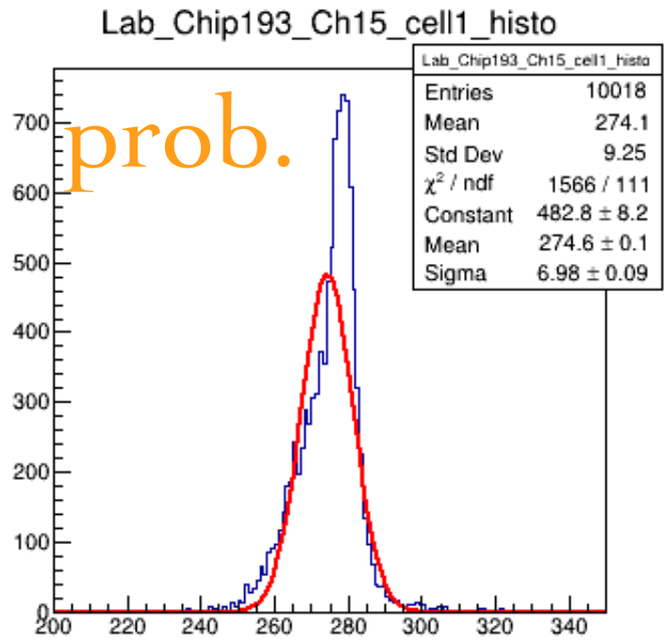


Figure 8: SPIROC one channel diagram

cell N0.4



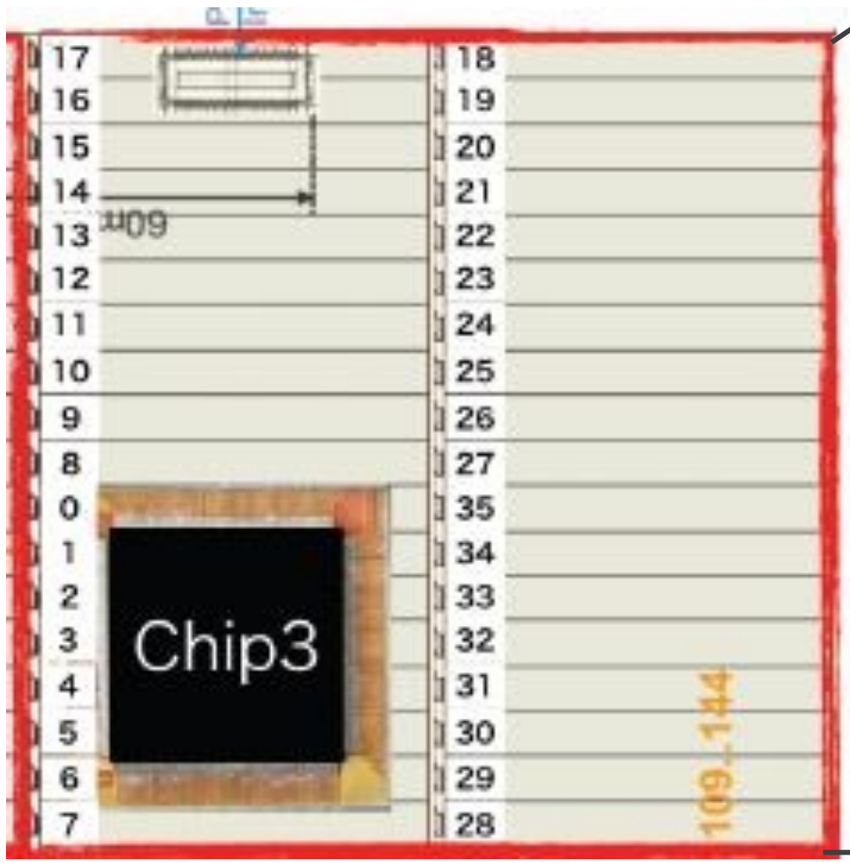
cell N0.1

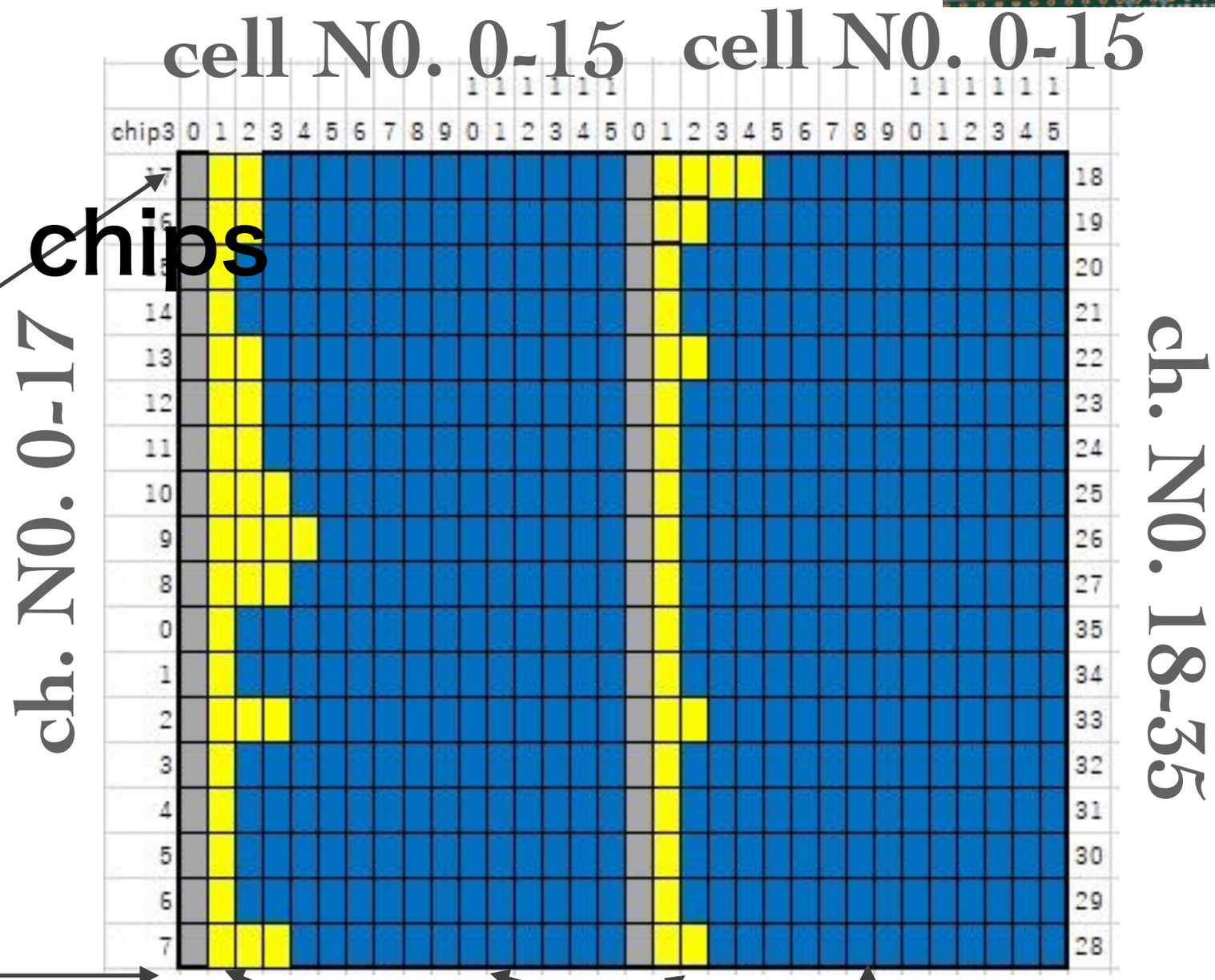


same chip & same channel

SPIROC2b m-cell

- memory cells
- pedestals
- similar to other chips





smaller cell No.s aren't gaussian

prob.

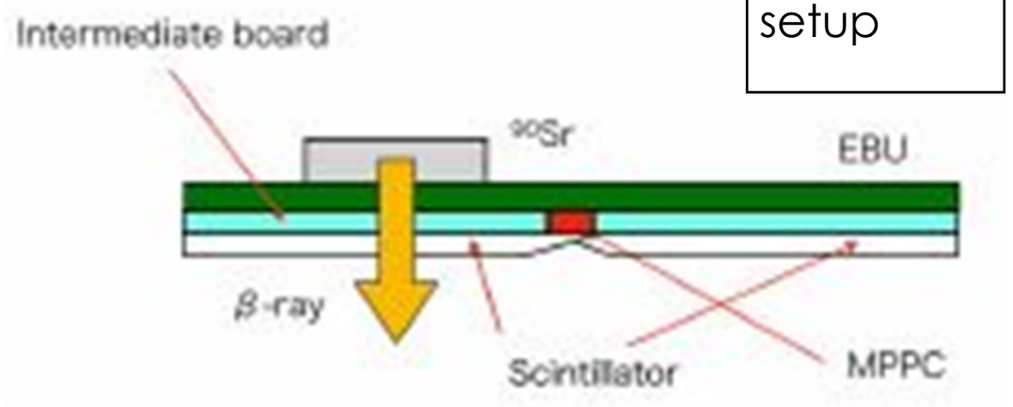
good

SPIROC2b

SPIROC2b

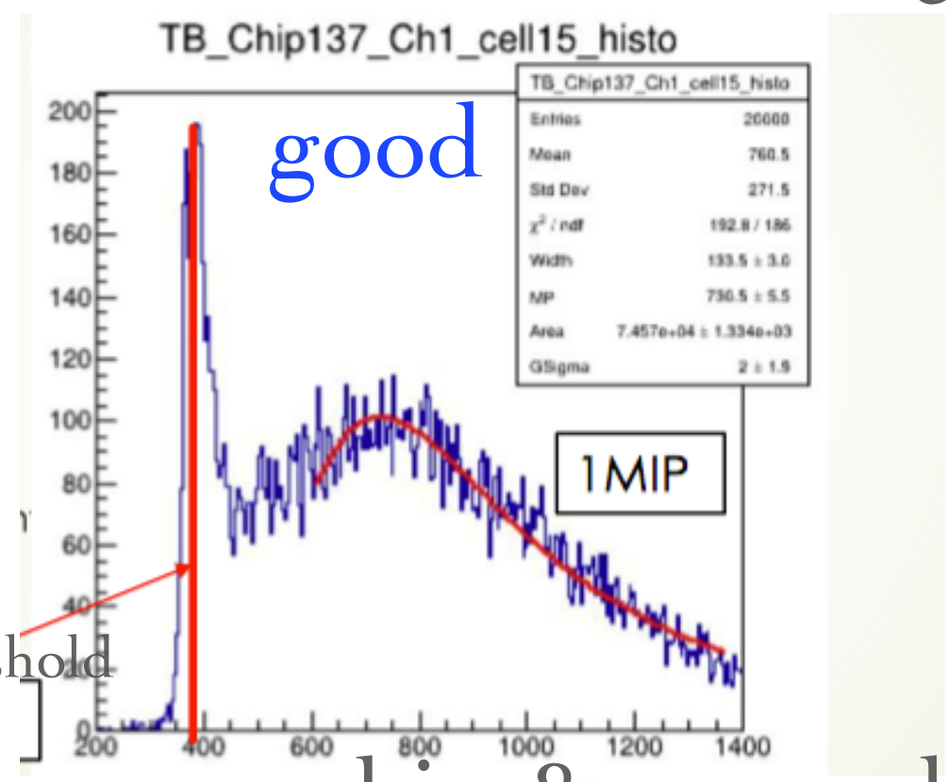
- memory cells : cells
- cell No. dependence
- MIP signal with 90Sr

setup

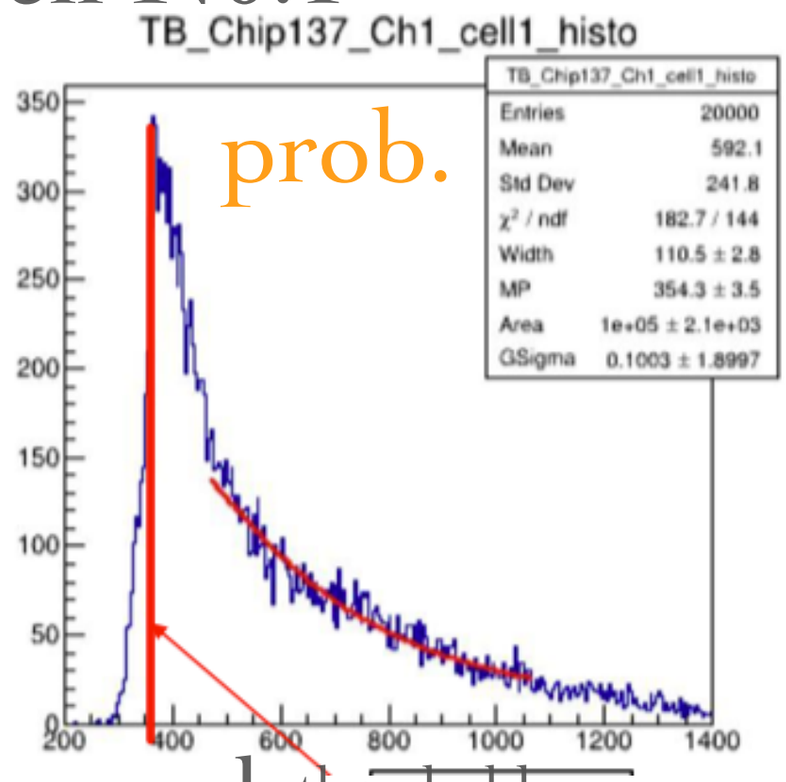


Use 90Sr without collimater, MIP measurment

cell N0.15



cell N0.1

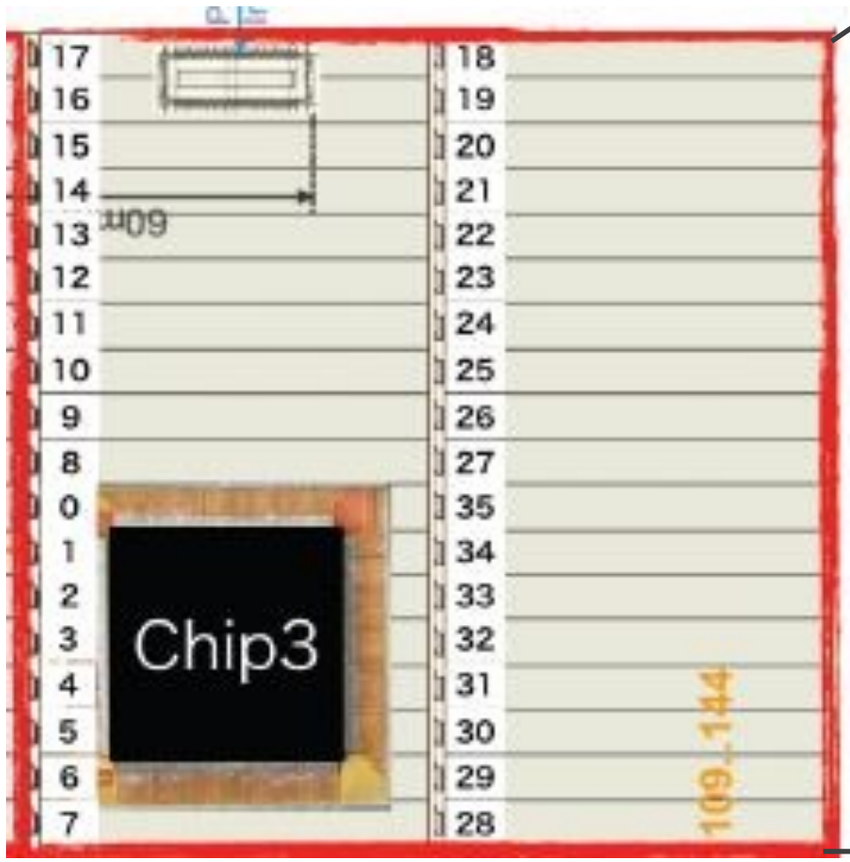


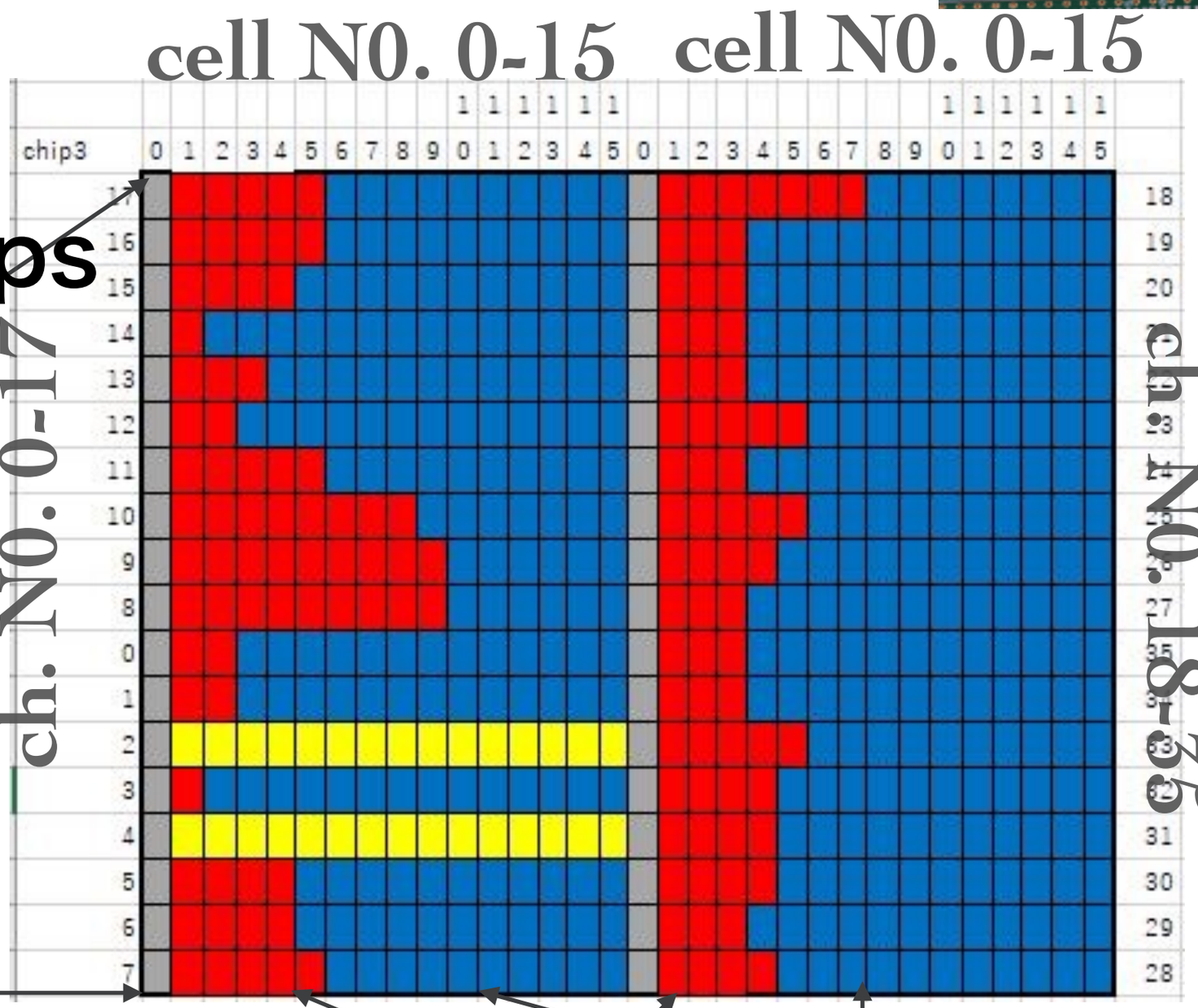
same chip & same channel

MPPC with 15um pitch

SPIROC2b m-cell

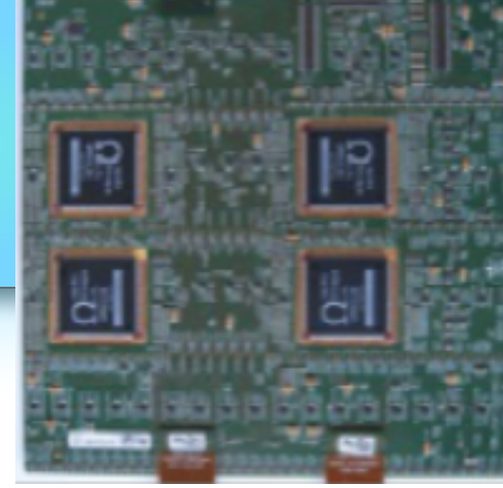
- memory cells
- MIP by 90Sr
- similar other chips



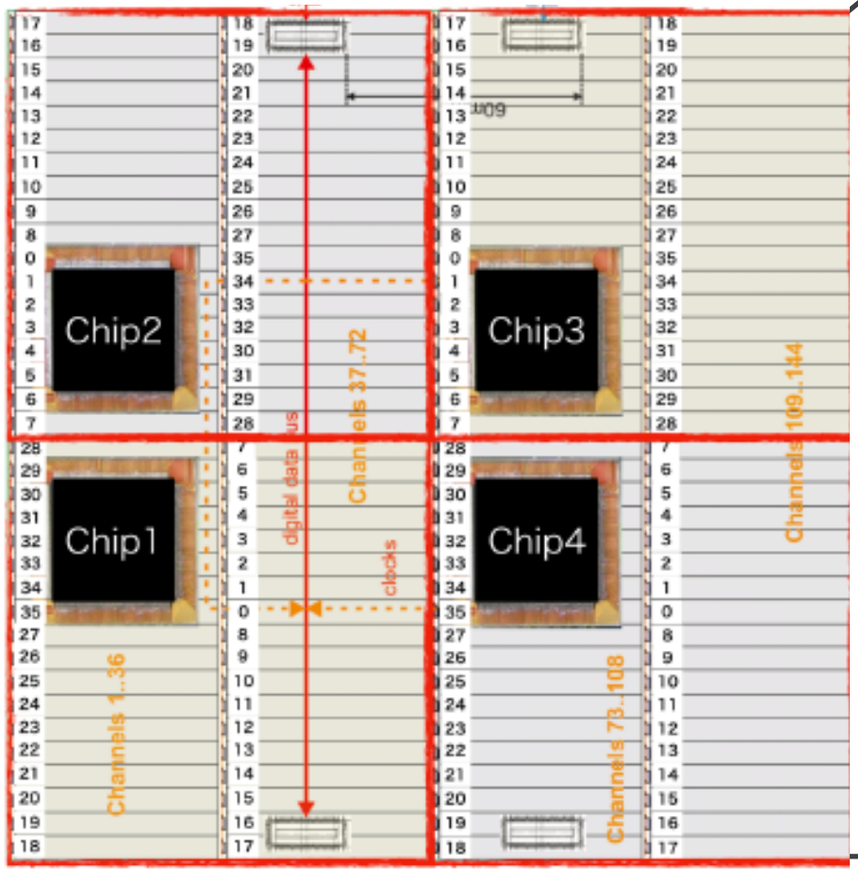


smaller cell No.s can't resolve MIPs

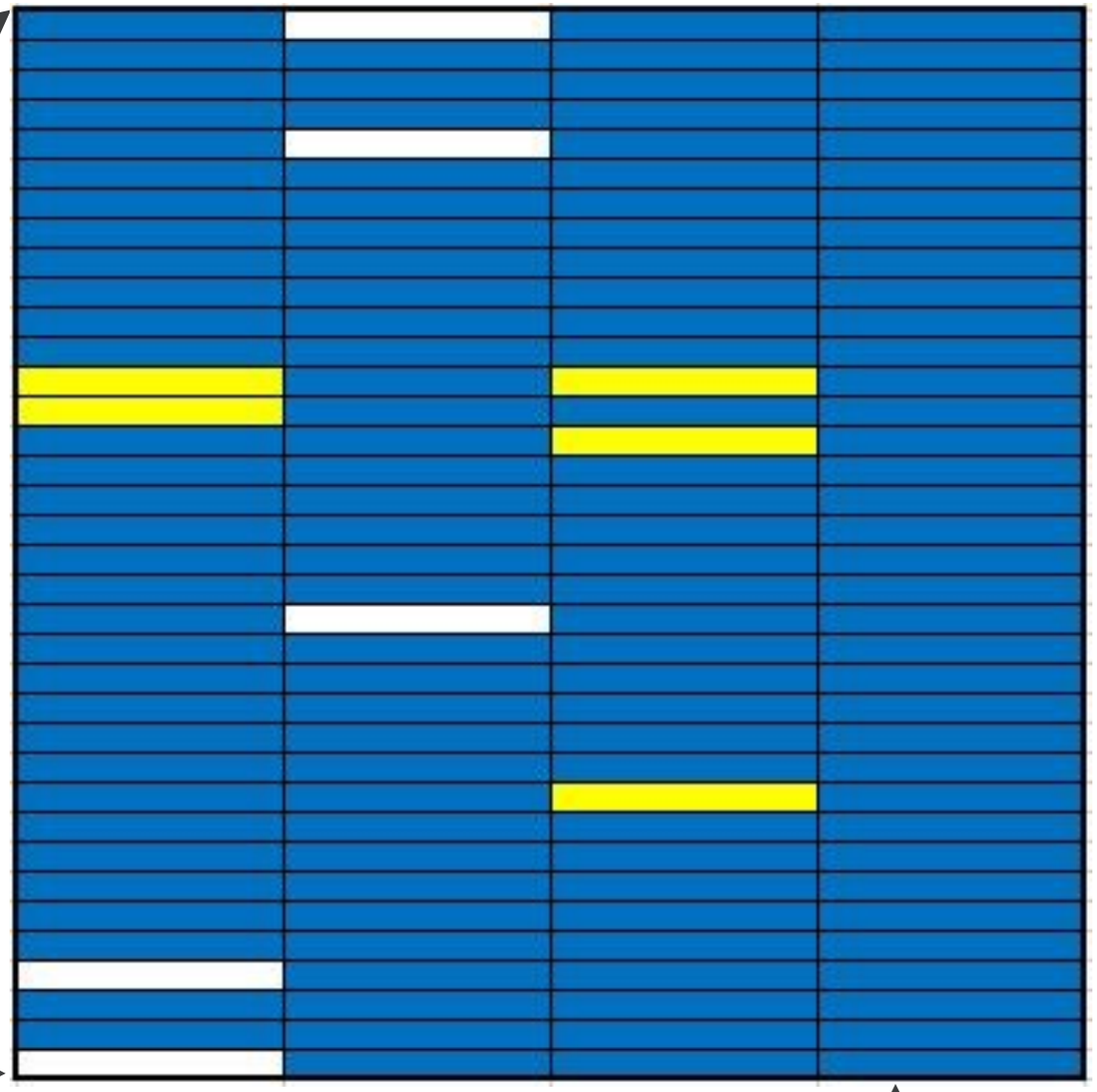
EBU :MIP



- memory cells
- MIP by 90Sr
- cell No. >10



EBU

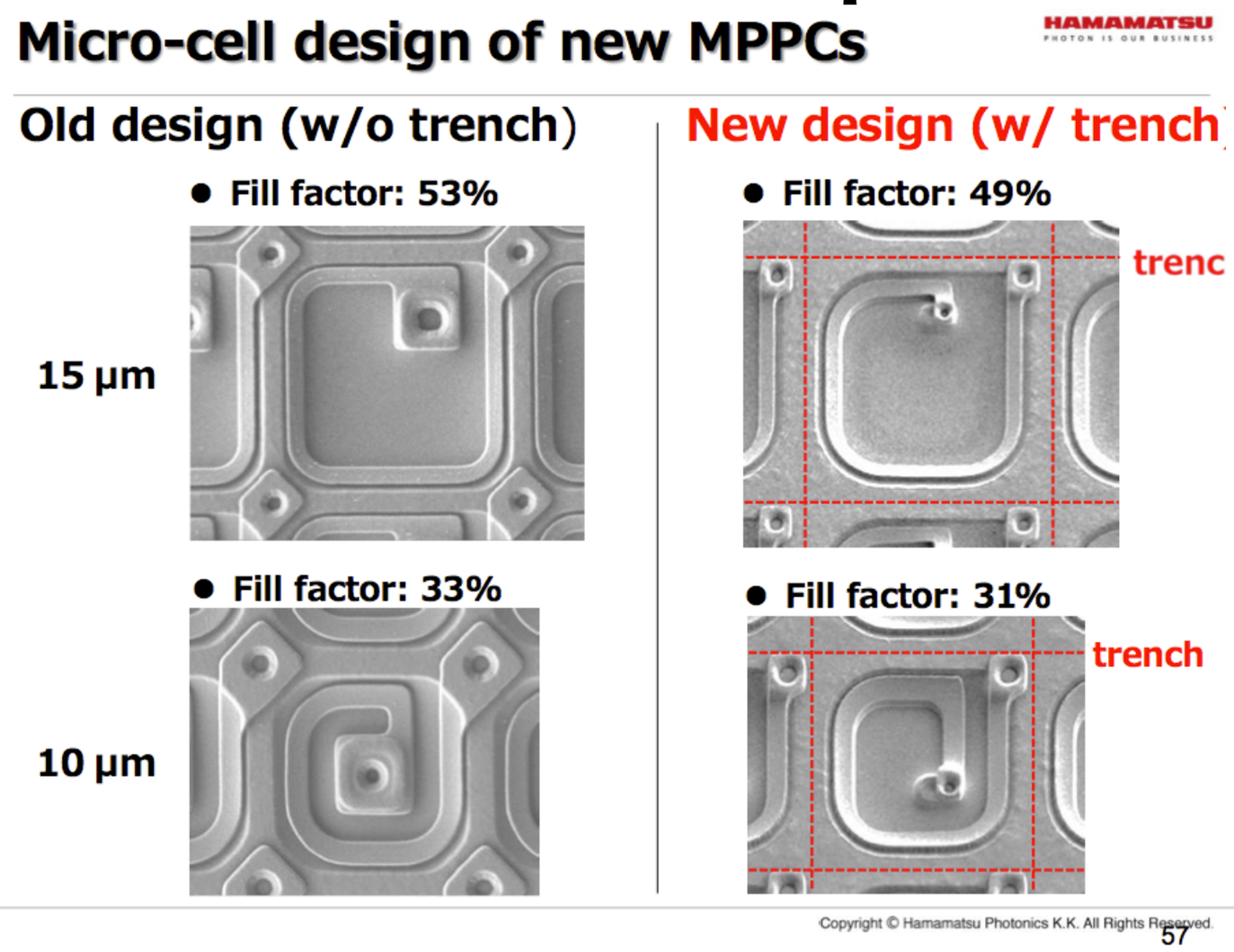


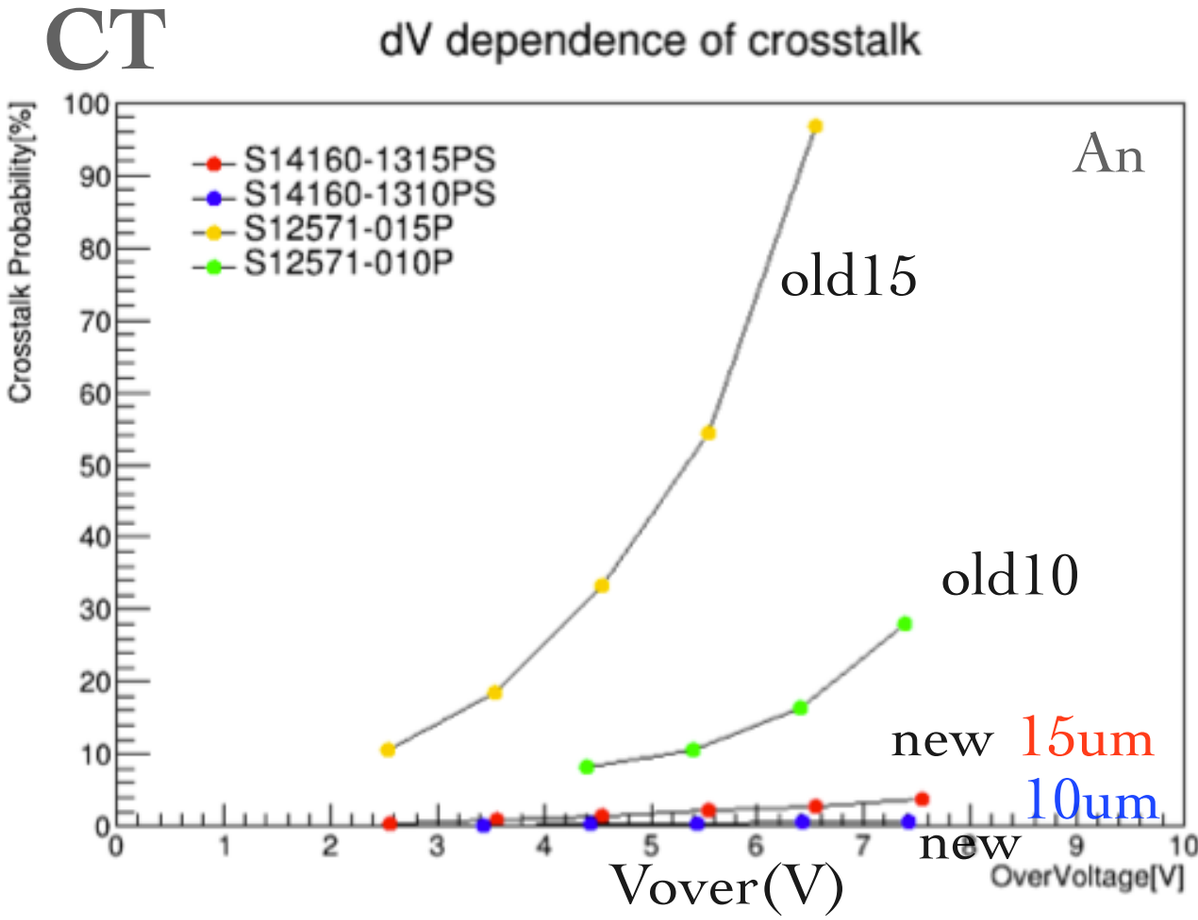
134/144 MIP distinguished

good:MIP seen

photo-sensor MPPC

- new sensors with trench to reduce cross talk : S14160 from Hamamatsu
- 10 & 15 um pitch





cross talk reduced

CT15um>CT10um

new photo-sensors

- signal difference
  due to thinner avalanche region>>increase C
- new sensor is slower than previous S14160 version S12571

previous

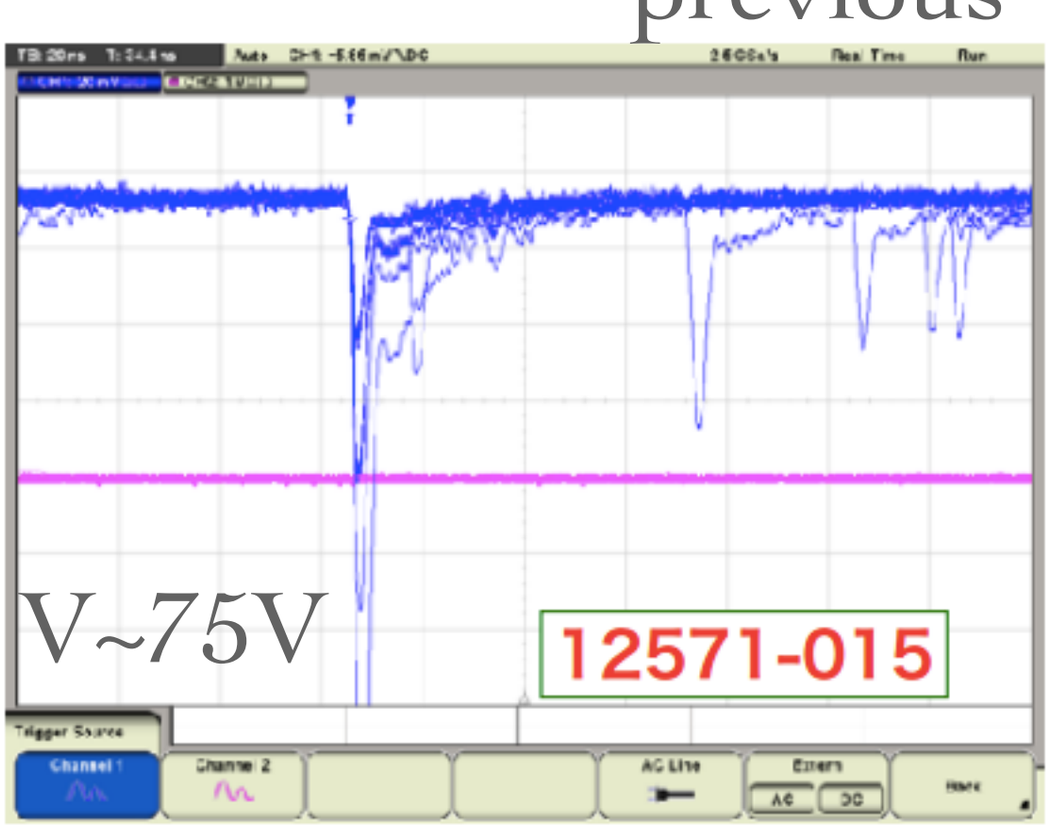
new

new photo-sensors

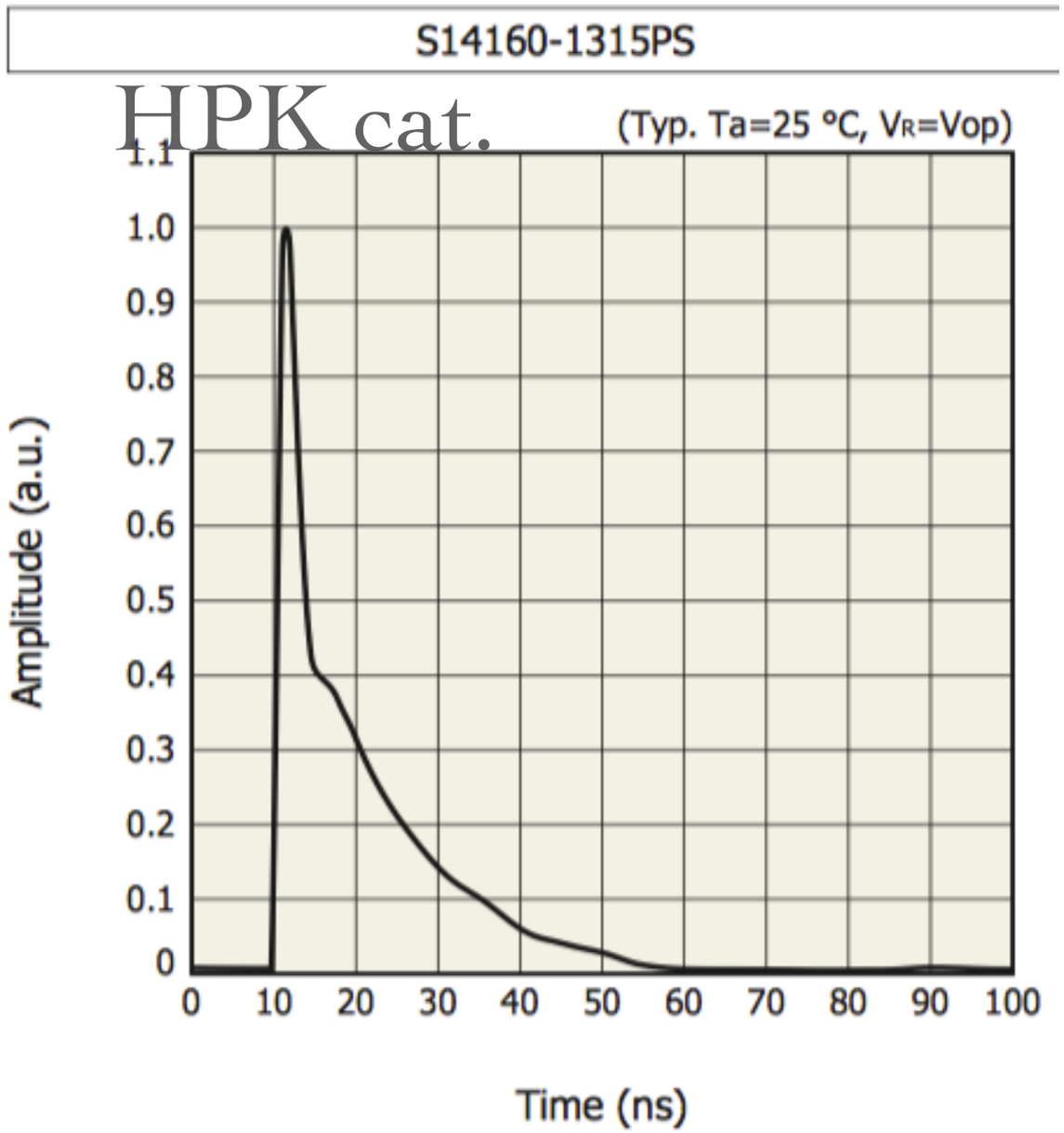
- signal difference
  due to thinner avalanche region>>increase C
- new sensor is slow

S14160 version

previous

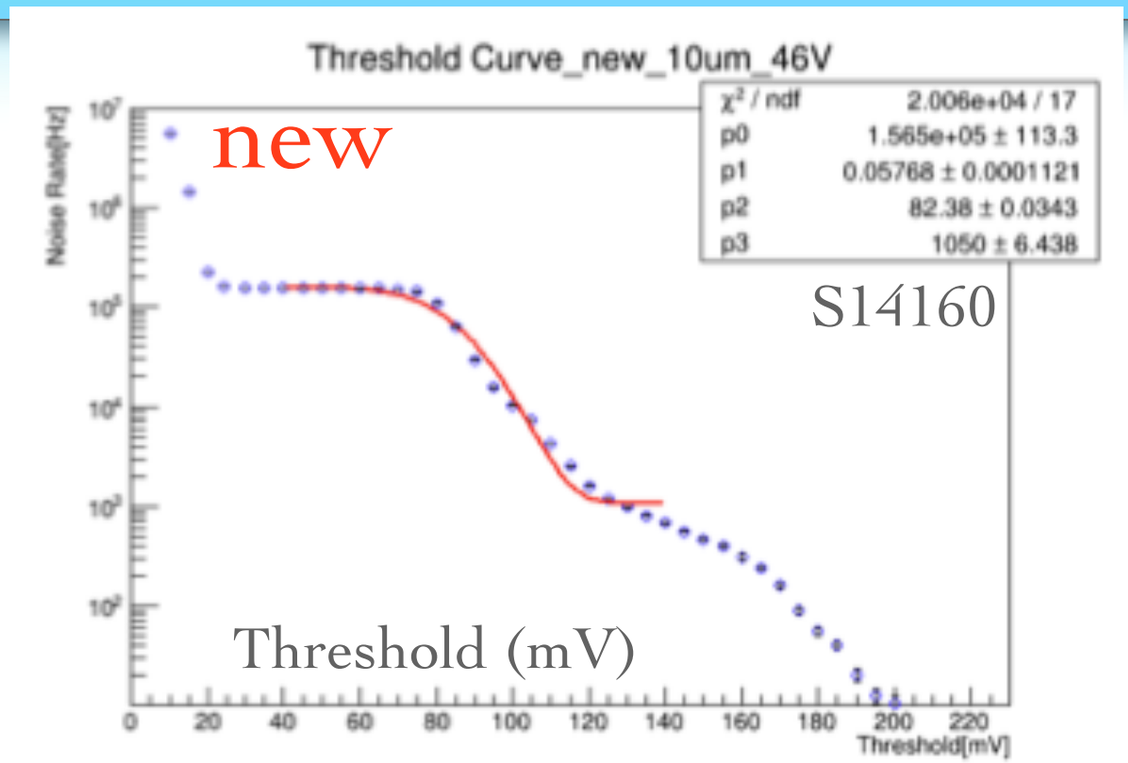


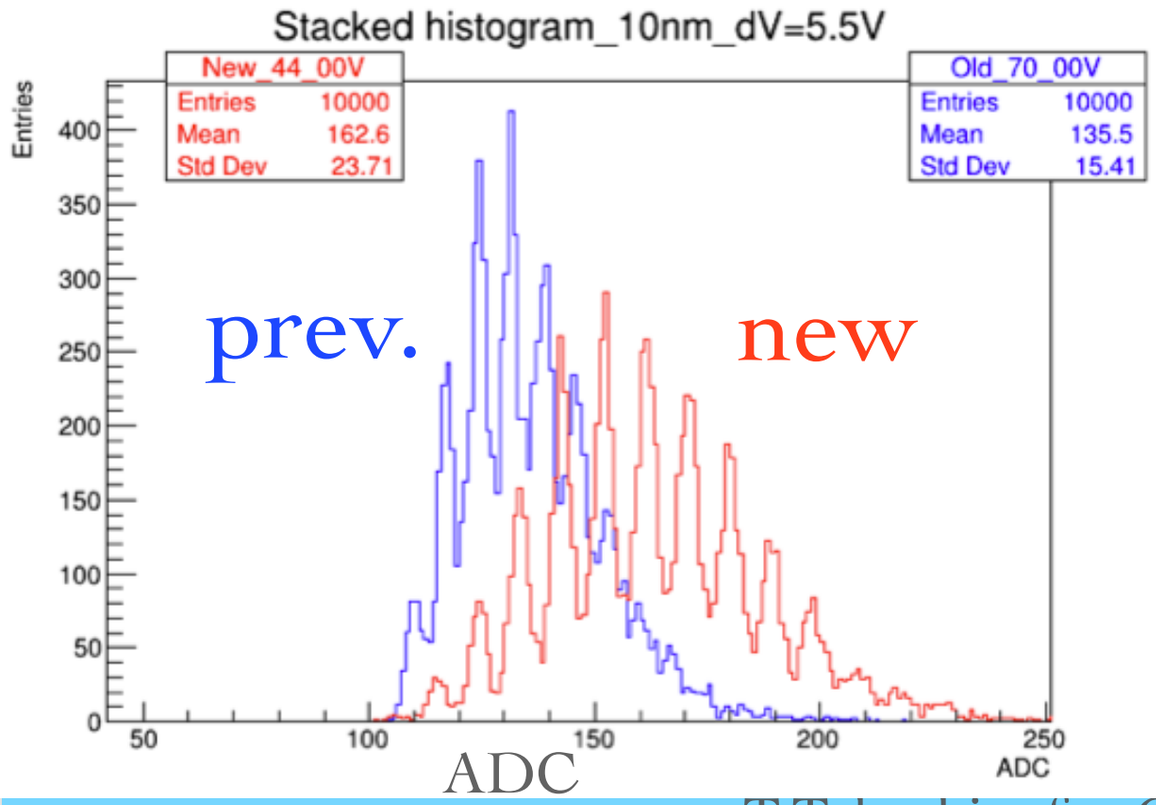
HPK cat.

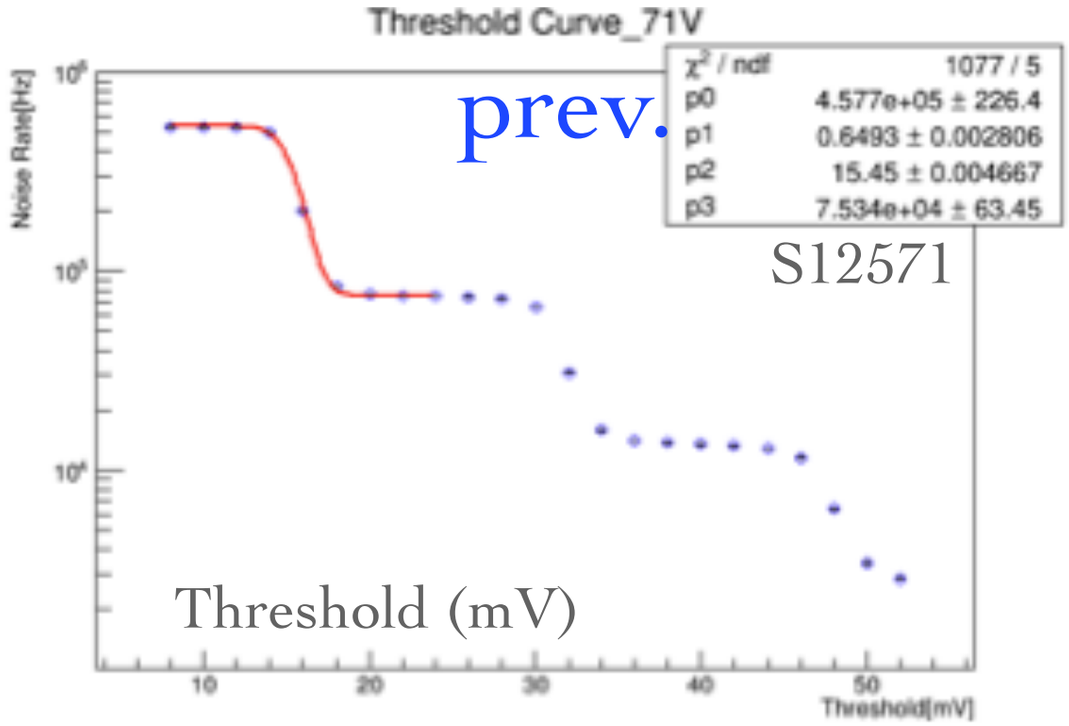


MPPC threshold curve

- 10um MPPC
- threshold curve is not sharp enough
- photon separation looks good

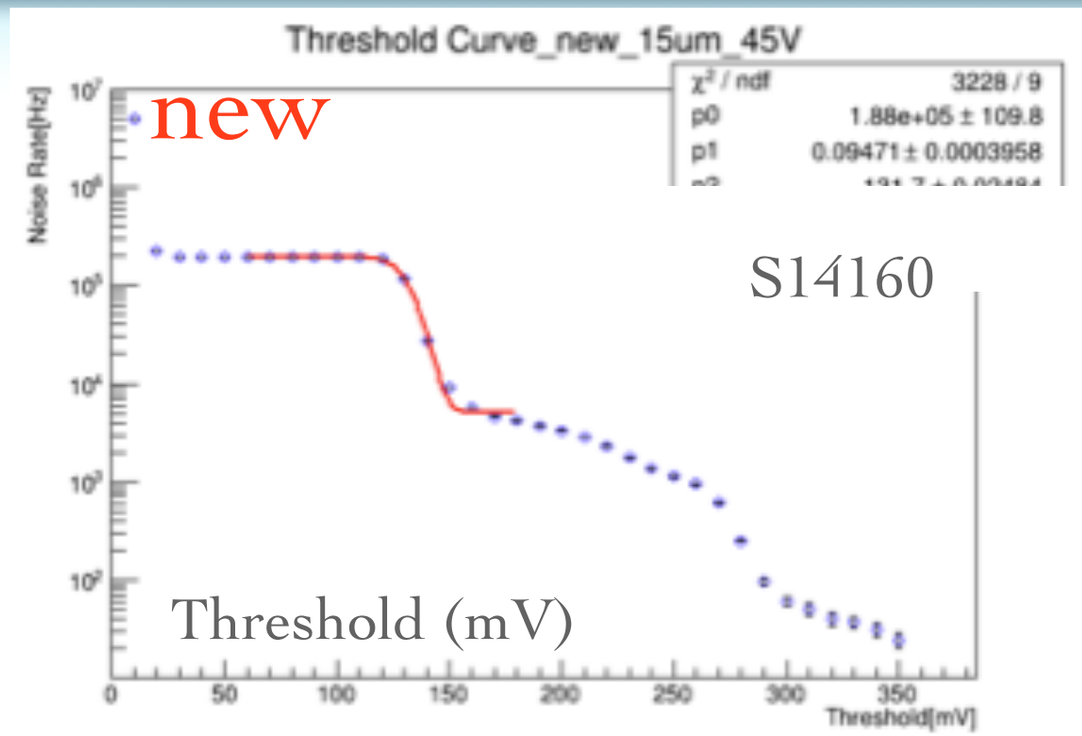


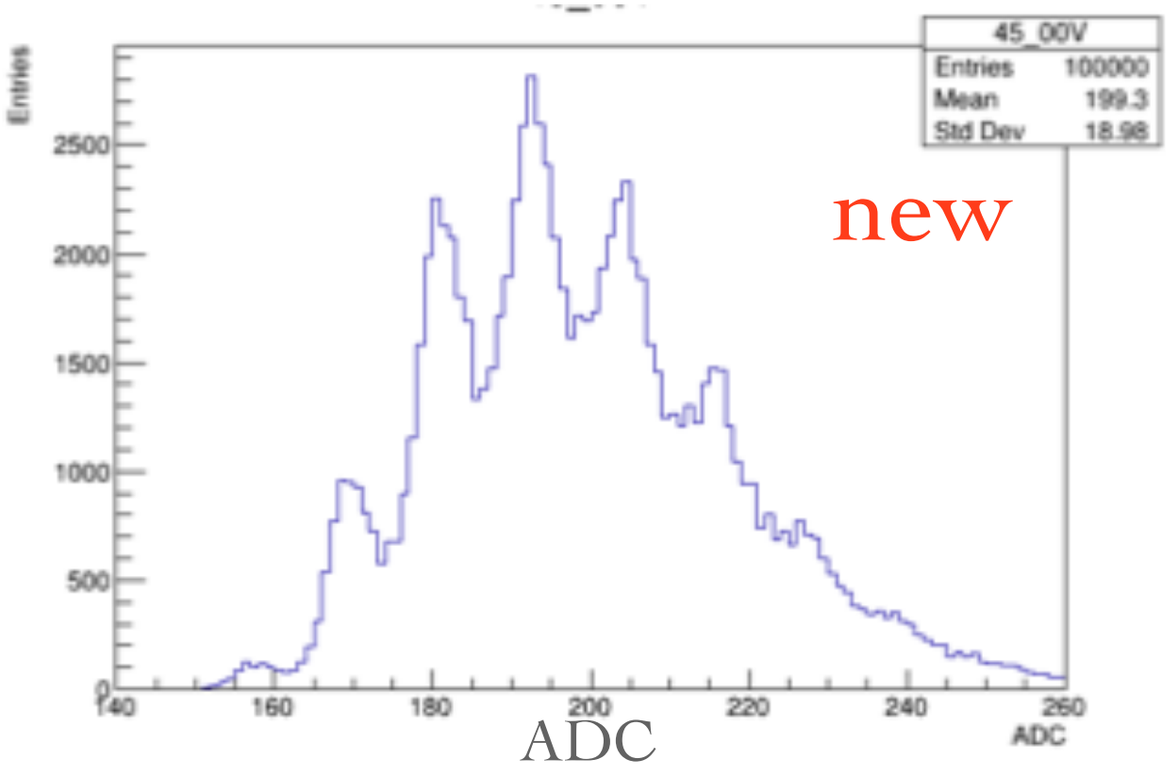


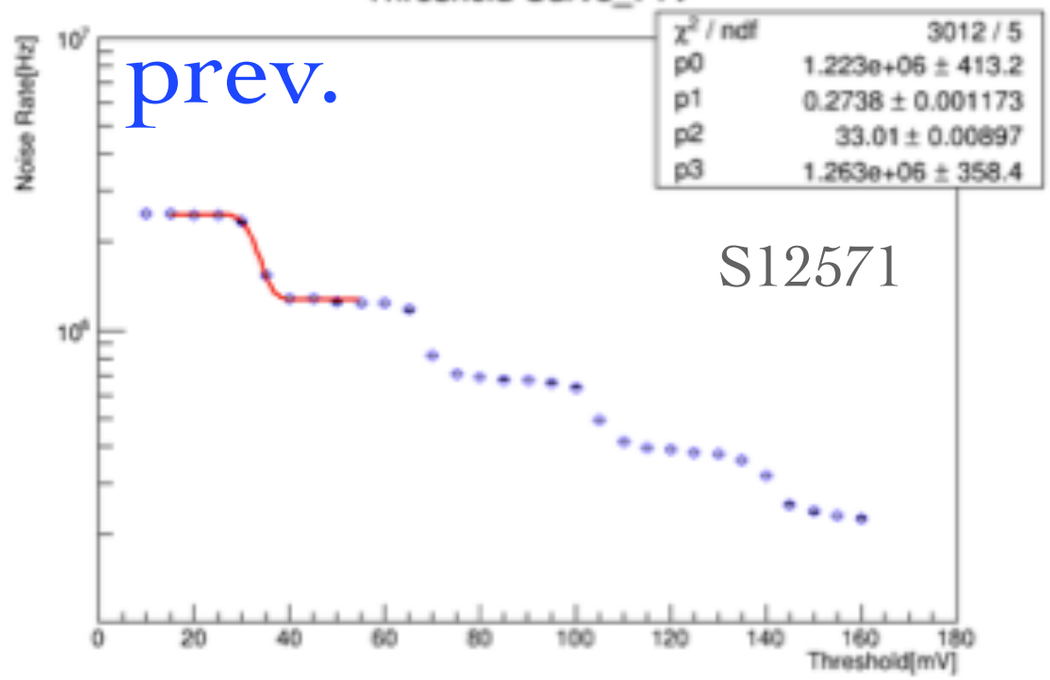


MPPC threshold curve

- 15um MPPC
- threshold curve is not sharp enough
- photon separation looks good





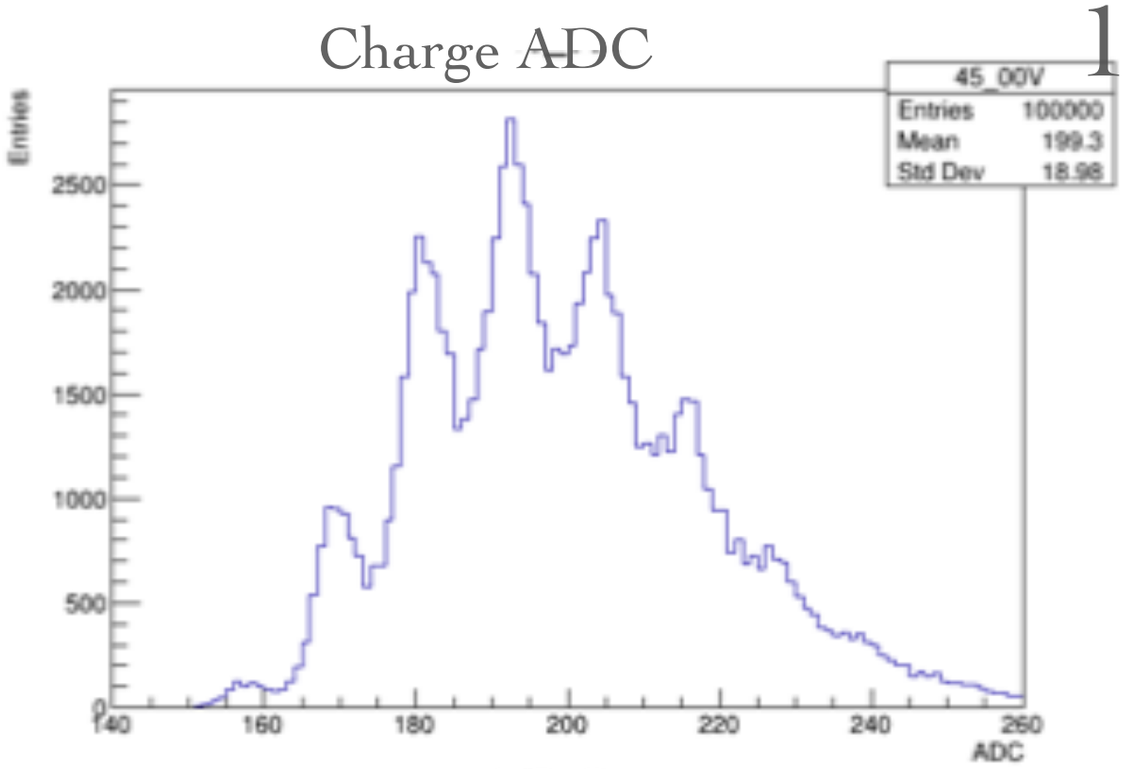


MPPC photon separation

- new S14160 10/15um MPPC
- threshold curve is not sharp enough
- effect of trench ?
- looking for the reasons

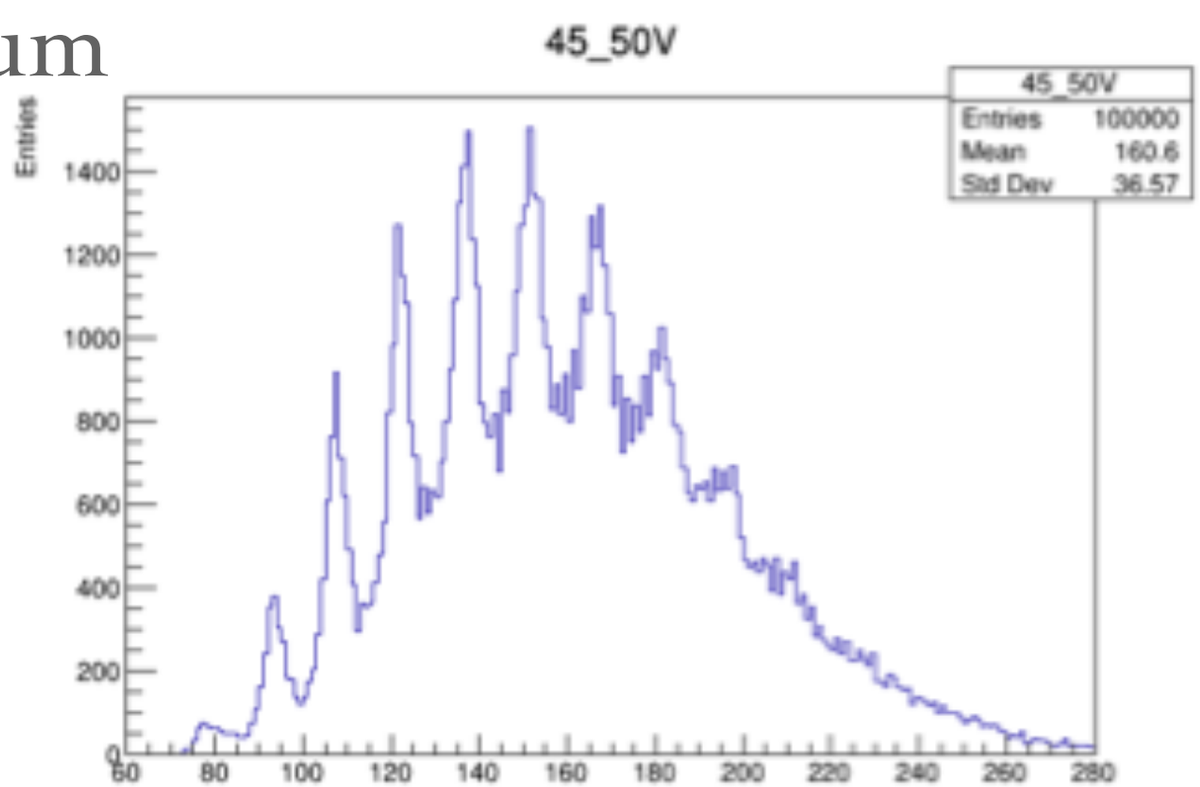
PHADC

Charge ADC



ADC

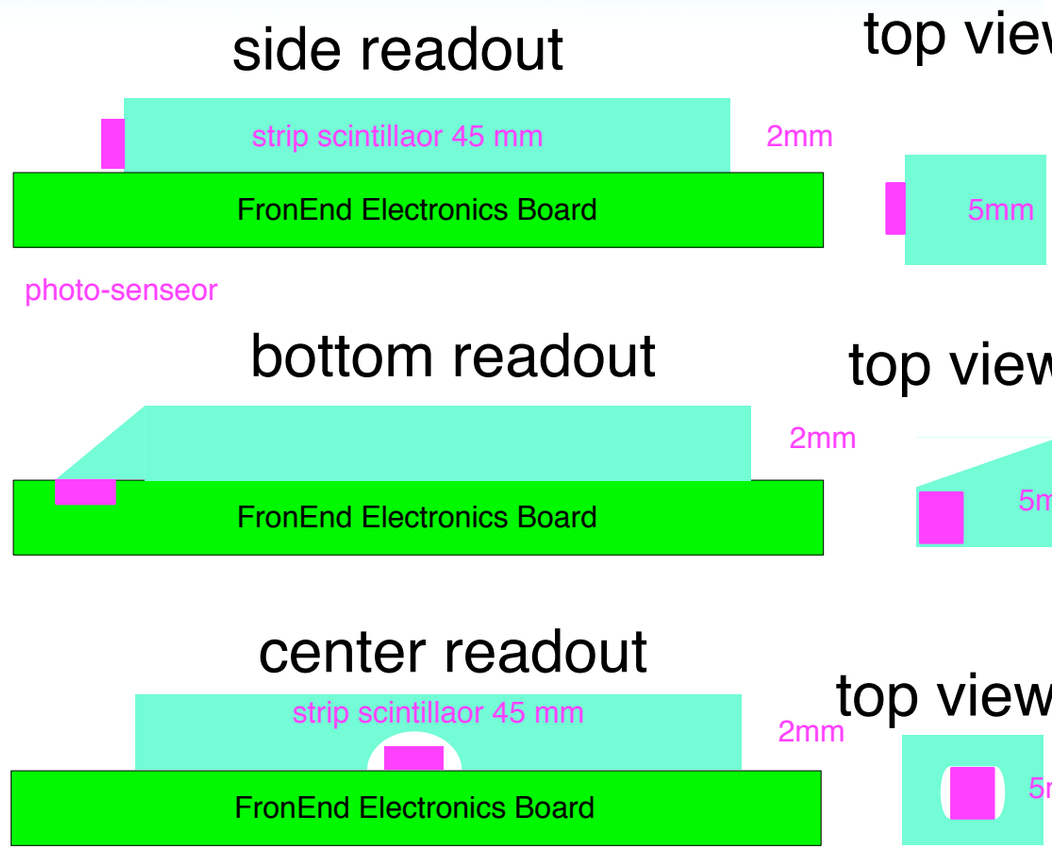
15um

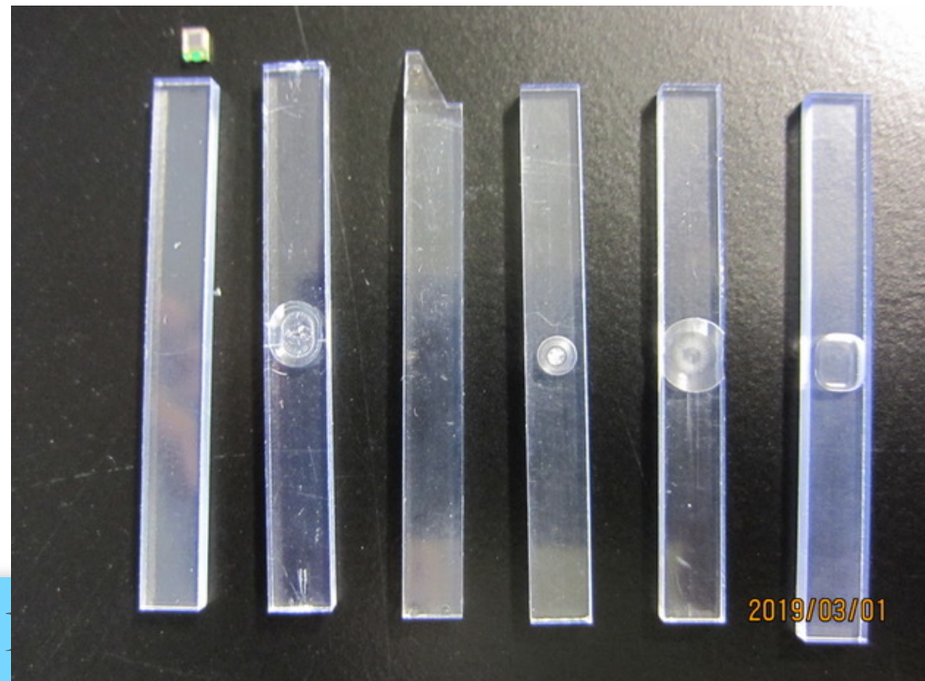


ADC

scintillator strip RO

- bottom read out is suitable for fabrication of EBU
- a center hole/dimple
- shape of a hole with
  - enough light yield
  - good uniformity

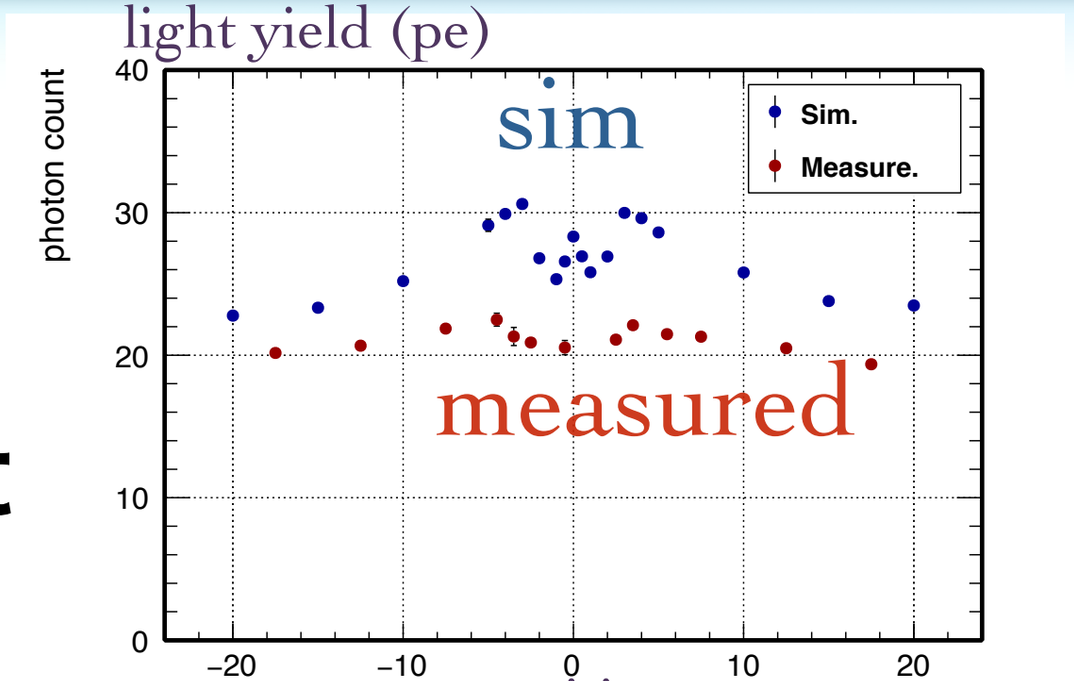


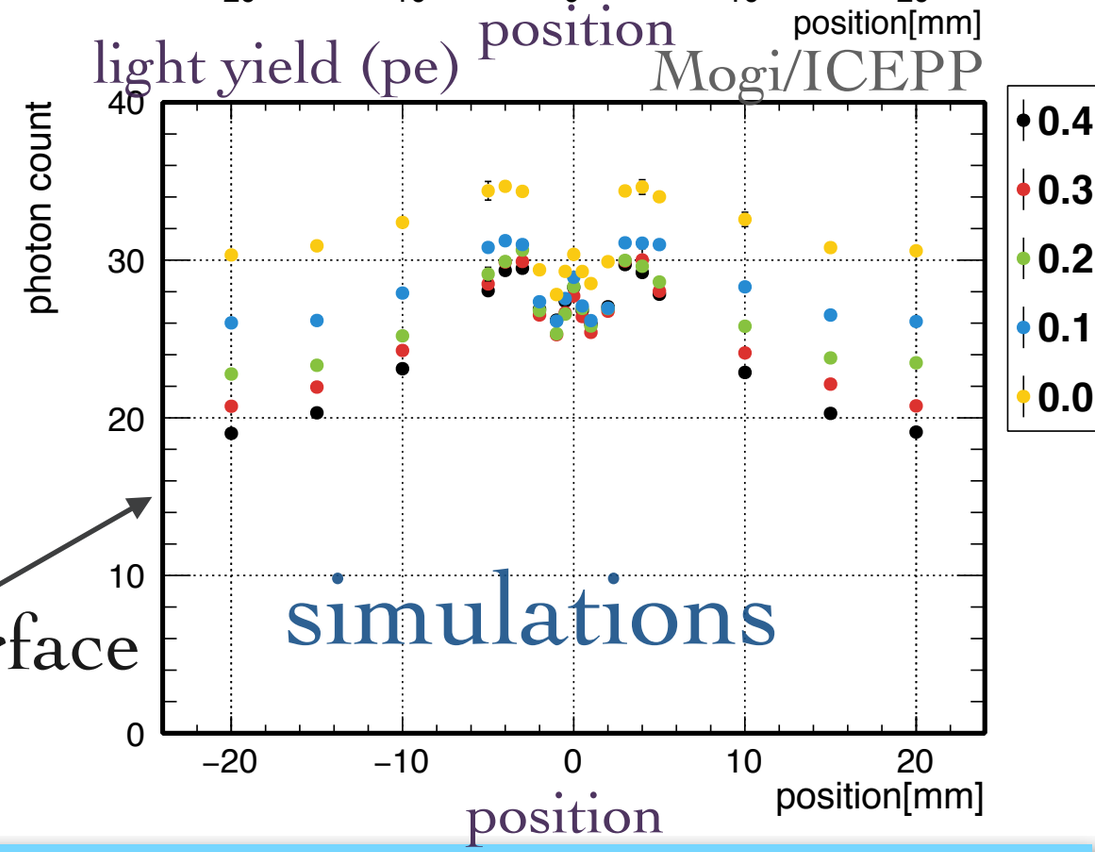


sc strips

strip with Center Hole

- center hole/dimple is tested
- compared with G4-light simulation
- still many parameters must be tuned to get good agreement





diffusion rate at scintillator surface

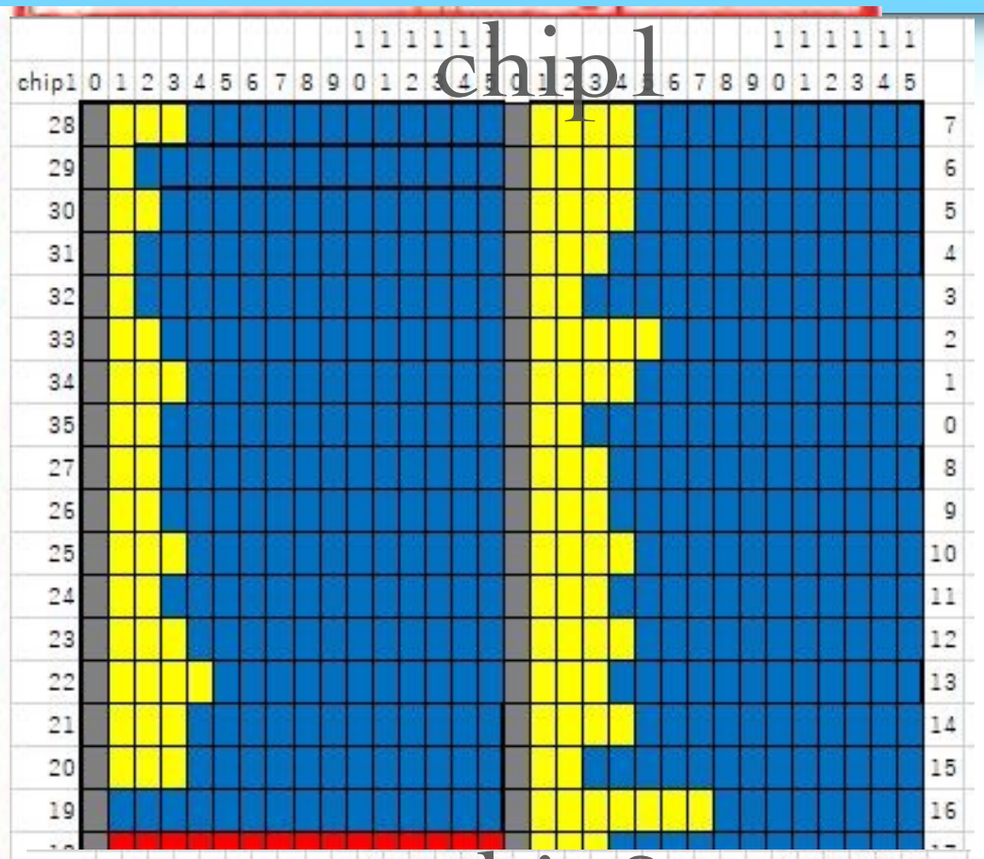
summary SCECAL

- scintillator strip ECAL development
- SPIROC2b and memory cells
- new 15um/10um pitch MPPC with trench
- center hole/dimple strip
- to another EBU

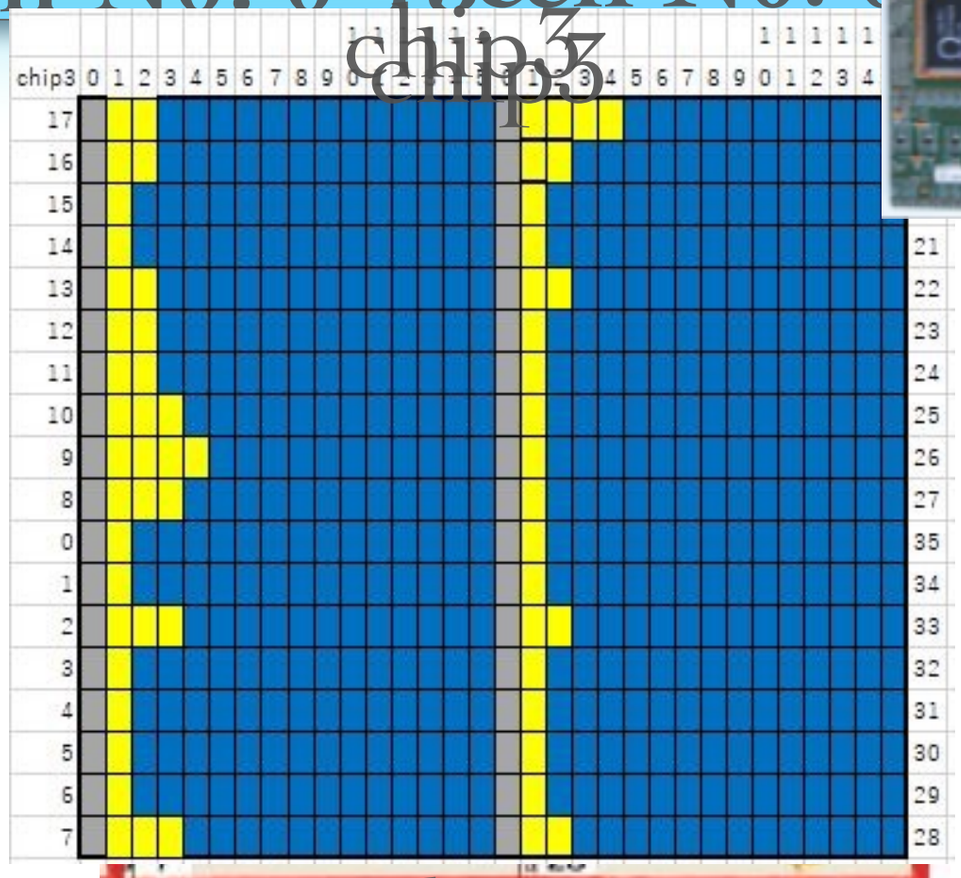
SPIROC2b ped.

cell N0. 0-15 cell N0. 0

chip1

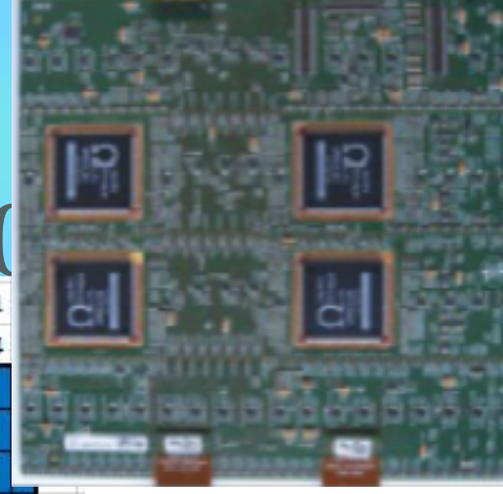


chip3

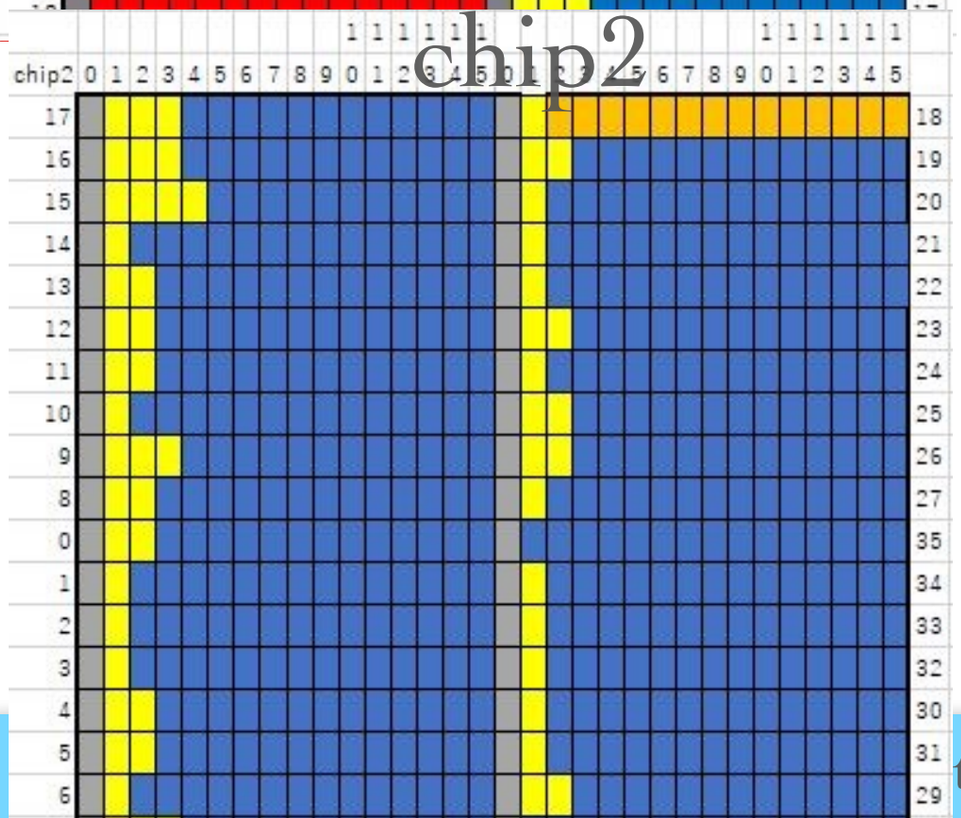


ch. N0. 0-17

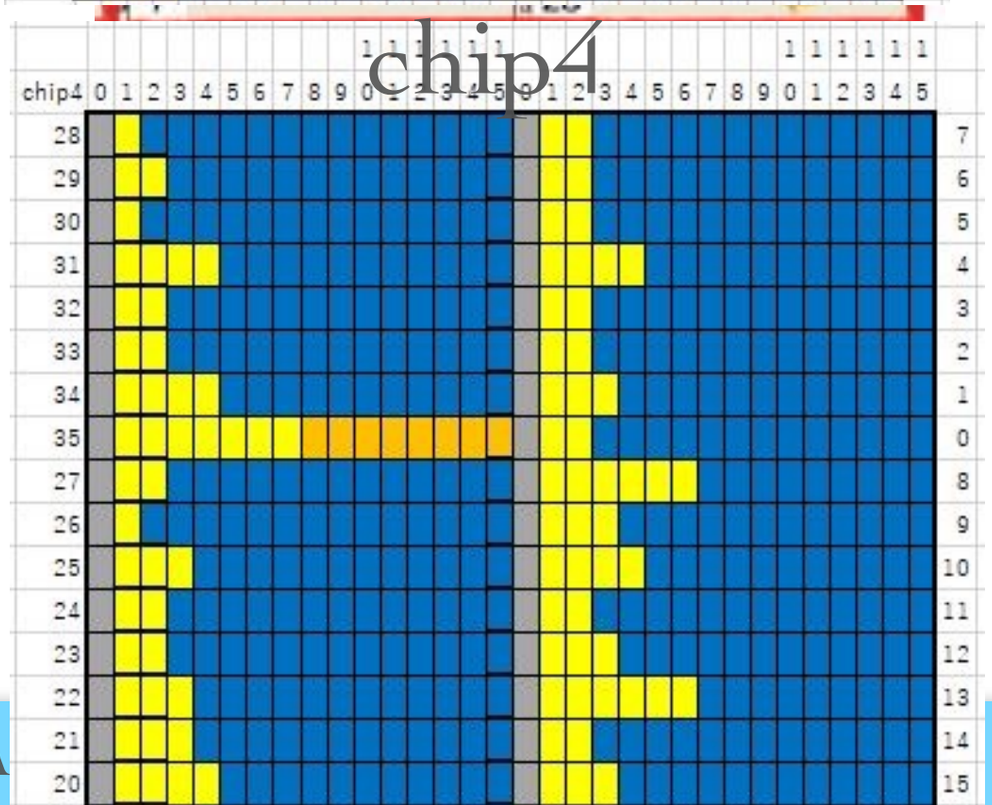
ch. N0. 18-35



chip2



chip4

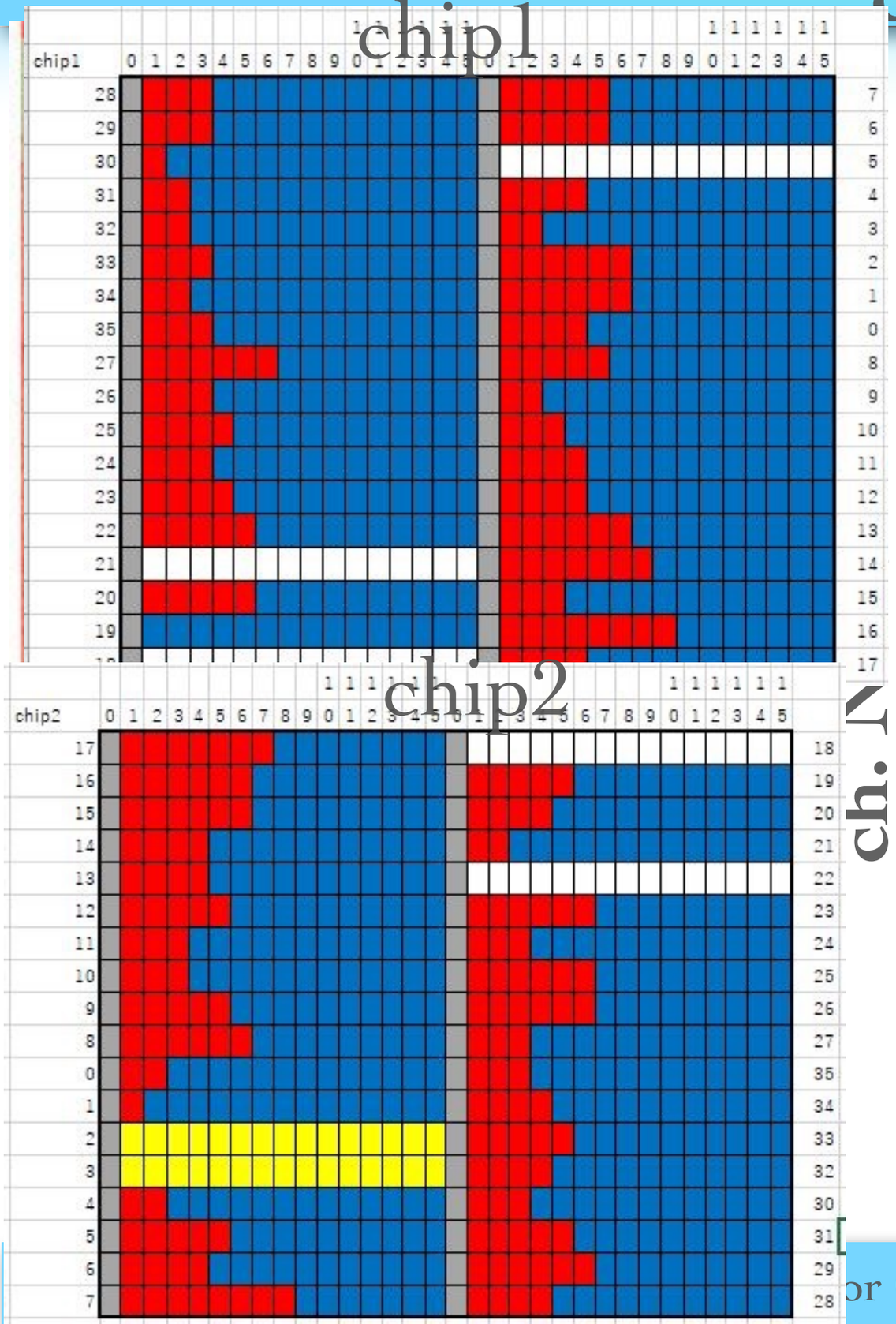


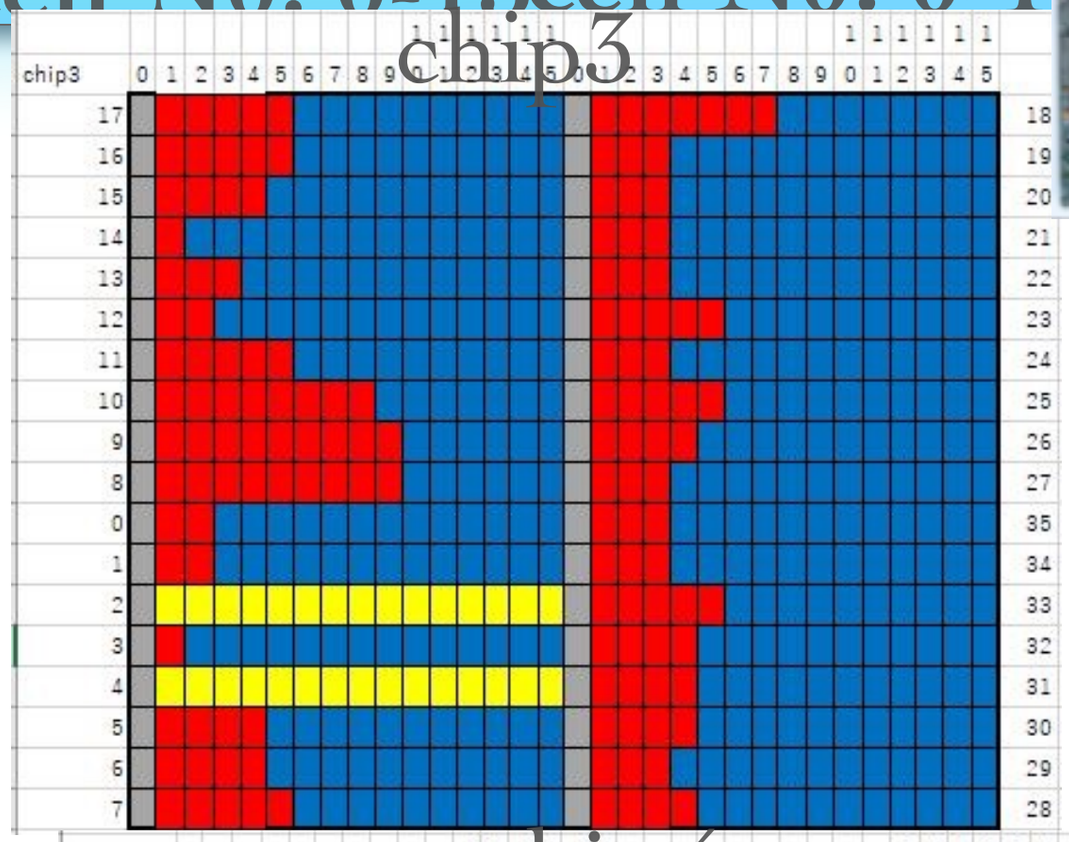
SPIROC2b

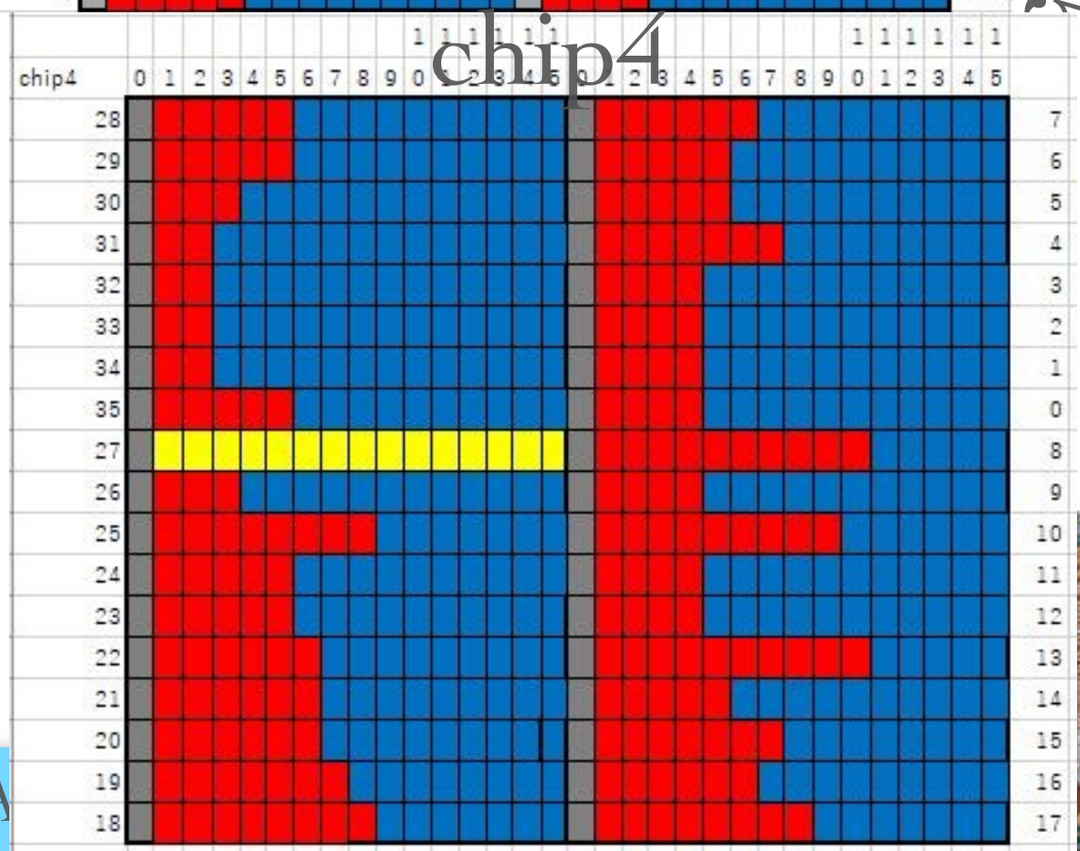
ta for CA

SPIROC2b MIP

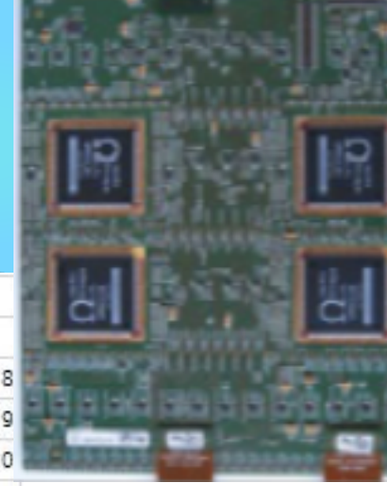
cell N0. 0-15cell N0. 0-1







ch. N0. 18-35



SPIROC2b

EBU : 15um, side R/O

side R/O

63 ch

mean~15p.e.

LED & hole