

Outline of GLD-CAL beam test plan

- Fine segmented ECAL prototype -

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- Prototype (W/Sci)

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Introduction

We are planning beam tests of ECAL prototypes using Multi Pixel Photon Counter (MPPC) readout system.

The prototypes have sandwich structure of tungsten plates and scintillator strips. Fundamental purposes of the beam tests are :

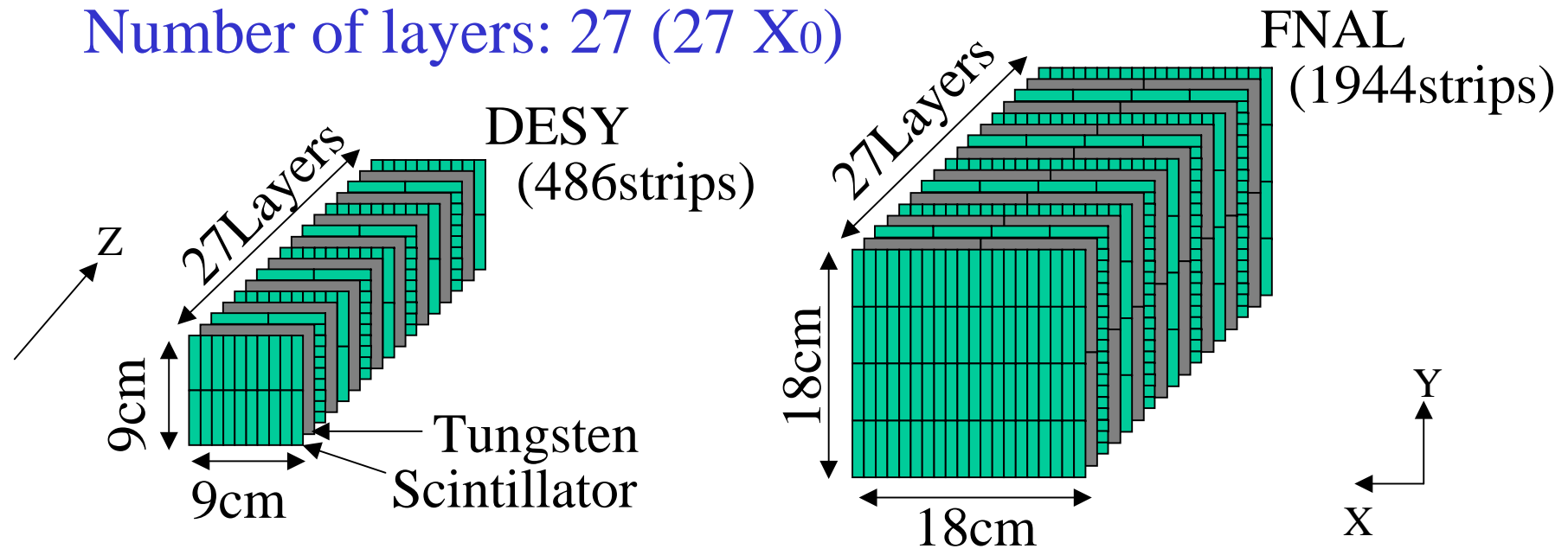
- Construct the fine segmented ECAL prototypes
- Get skills of the operating system about thousands of MPPCs in the detector.
- Test the performance in EM shower

Prototype ECAL - MPPC readout

Tungsten: 3.5mm Sci. strip: 3mm and/or 2mm

Strip size: 1cm (width) x 4.5cm (length)

Number of layers: 27 ($27 X_0$)



Cross section 9cmx9cm Test@DESY(This winter)

-> In EM shower (Non linearity of MPPC)

Cross section 18cmx18cm Test@Fermilab(2007)

-> In multi particle injection / Pi^0 reconstruction

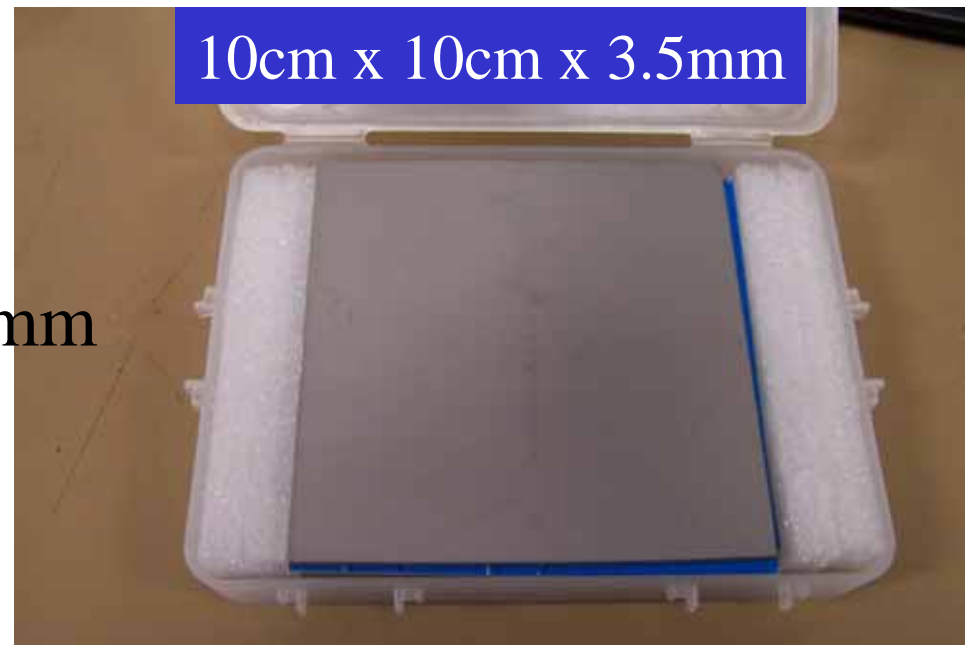
Absorber material

Tungsten:

128 plates

Thickness

$3.522 \pm 0.017 \text{mm}$



TaeguTec with help of KNU colleagues

Active material

Scintillator:

- Strip covered with TiO_2

By extrusion method with a hole in it (KNU)

- Mega strip plate

Several strips on a plate

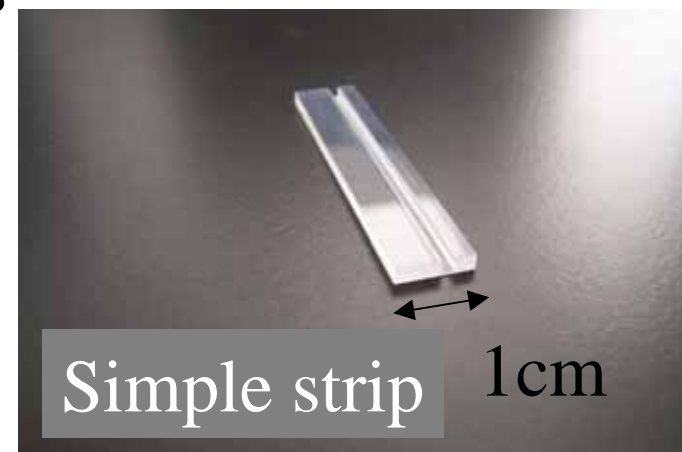
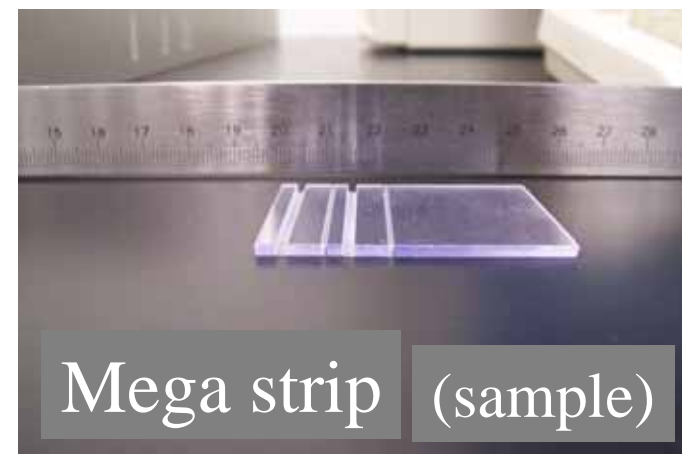
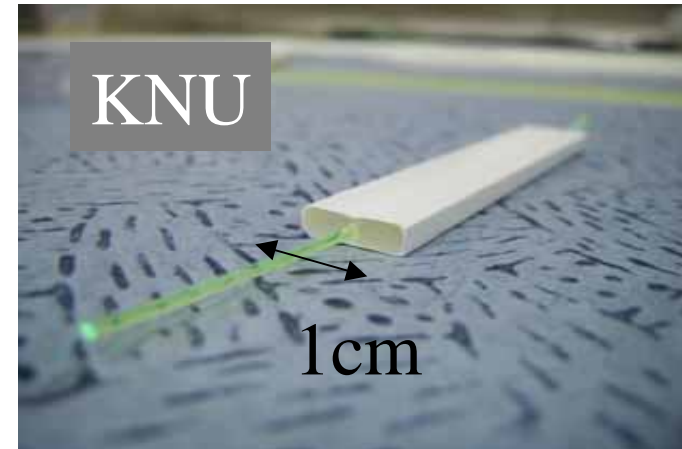
Separated by small grooves

Insert reflector film in the grooves

- Simple strip

Normal scintillator Strip

Cover it with reflector film

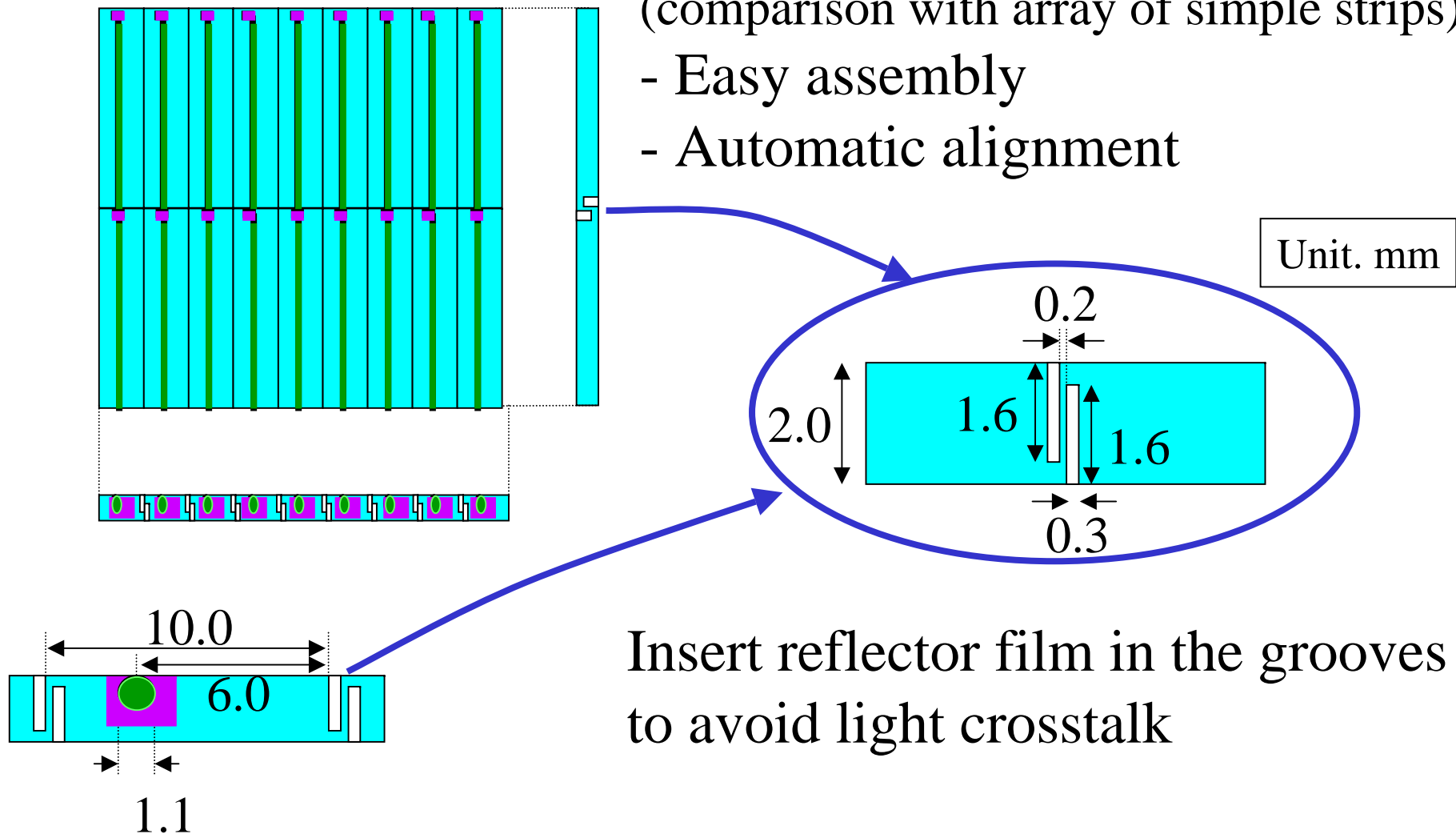


Structure of a mega strip plate

Merits

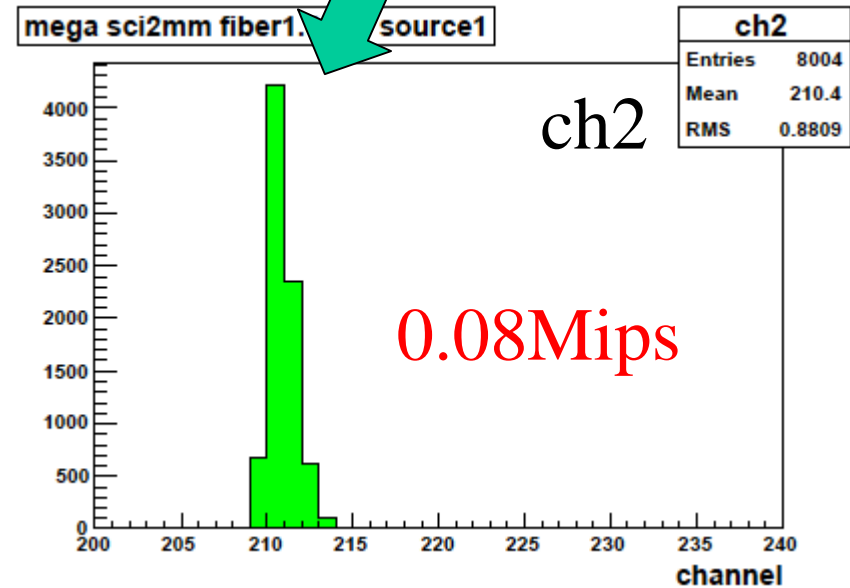
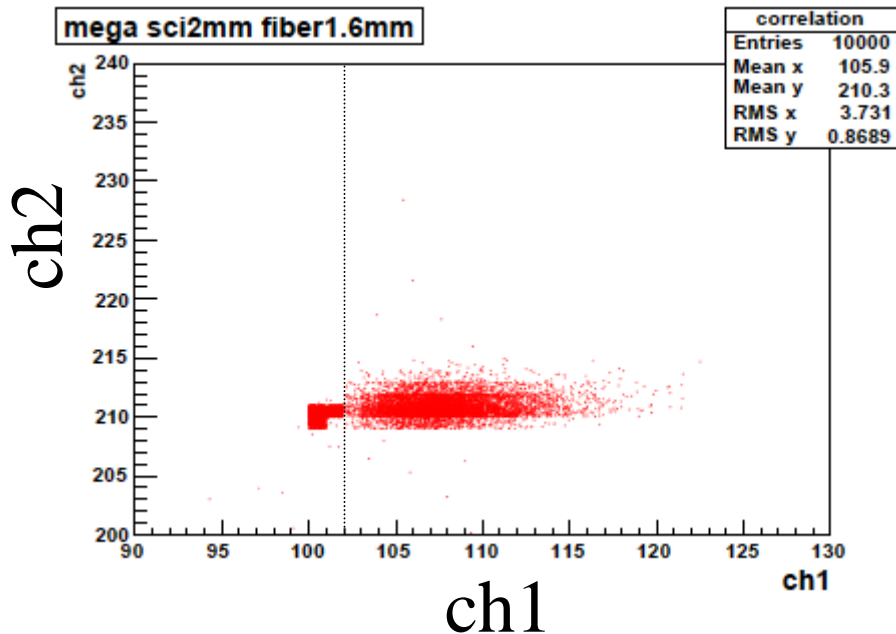
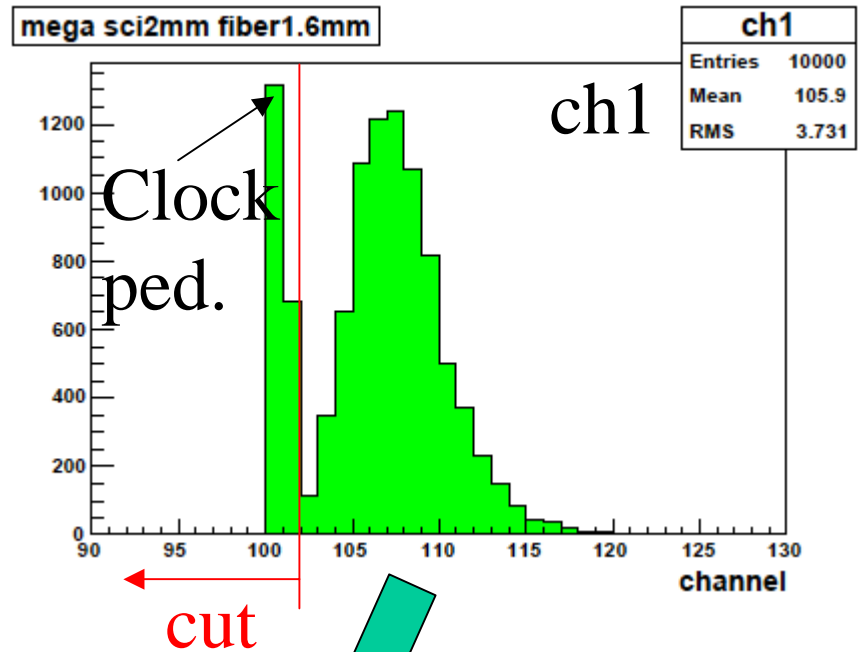
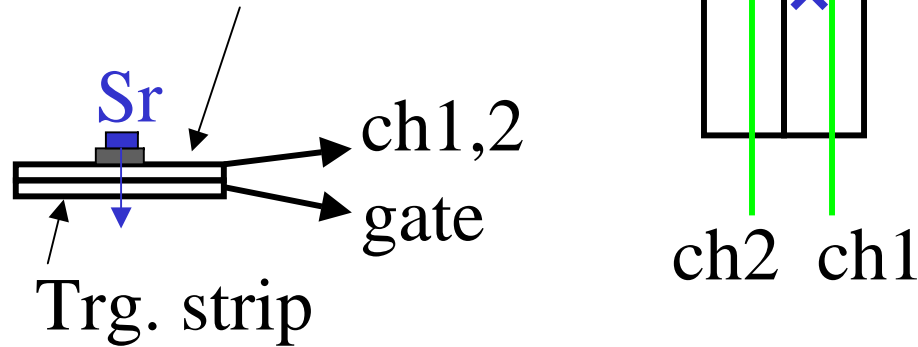
(comparison with array of simple strips)

- Easy assembly
- Automatic alignment



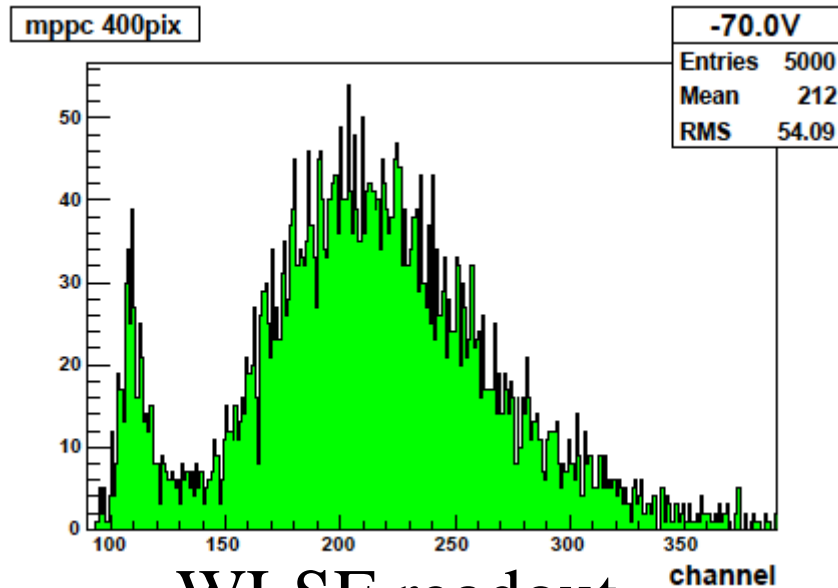
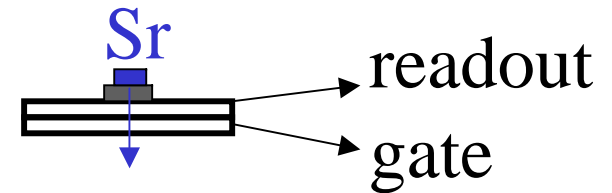
Insert reflector film in the grooves to avoid light crosstalk

Light Crosstalk of Mega strip

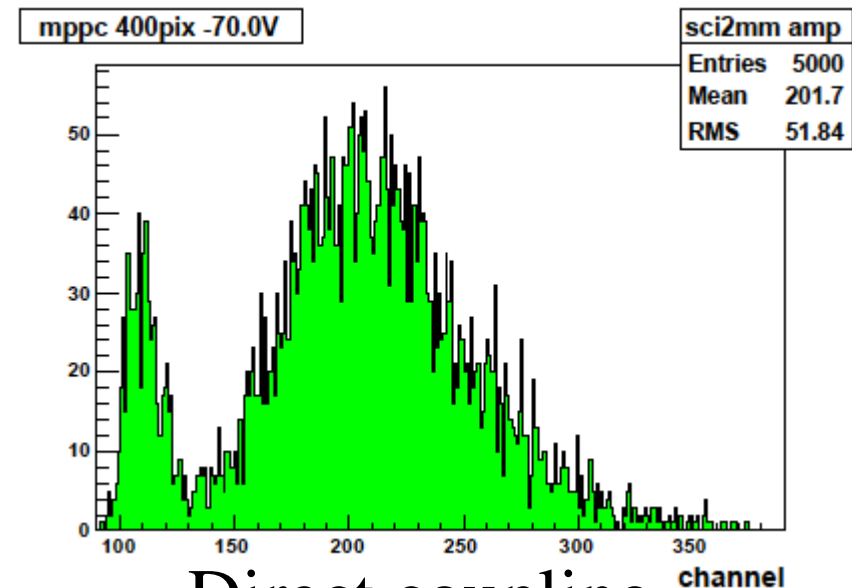
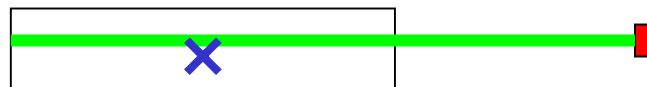


Direct coupling of MPPC

We do not need any grooves nor fibers



WLSF readout



Direct coupling

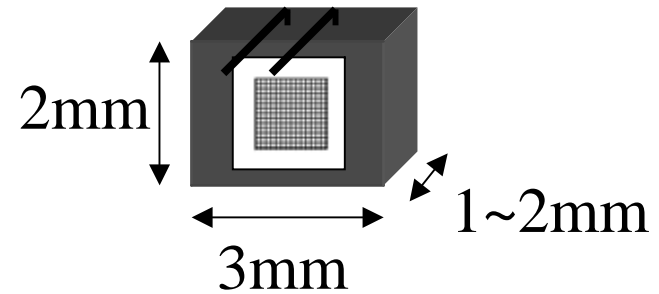


Direct coupling should be studied more.

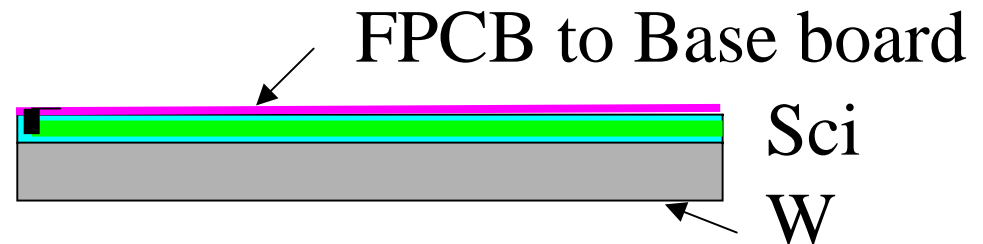
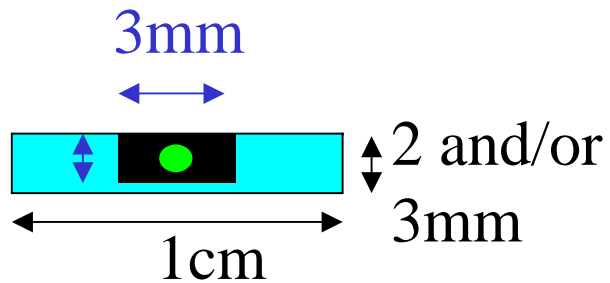
Need to check the dependence of source position.

MPPC package

We have proposed a package of 1600 pixels to HPK.



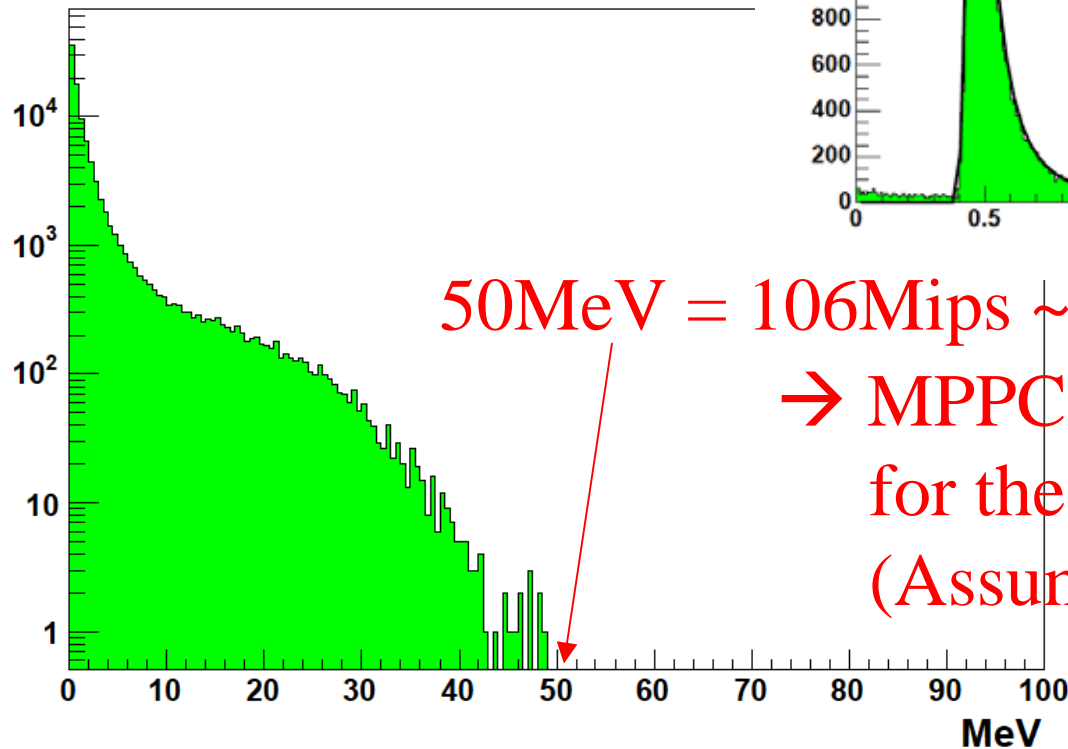
An MPPC is placed in a groove of a scintillator strip.



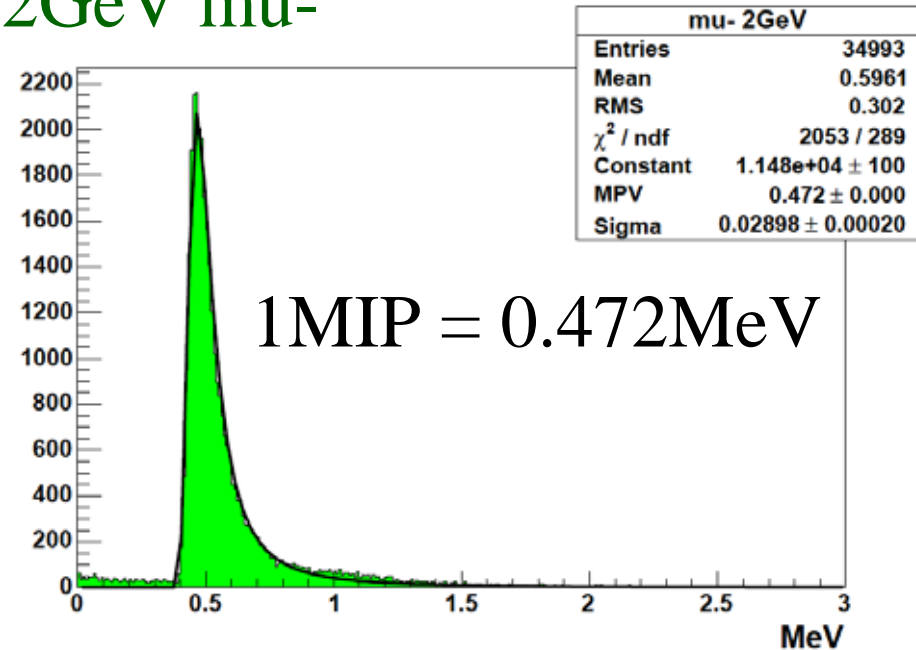
Dynamic range of MPPC

Energy deposit in a strip

6GeV e+ (Max @DESY)



2GeV mu-



→ MPPC:1600pixs is enough
for the beam test @DESY
(Assuming 1Mip < 10 pixels)

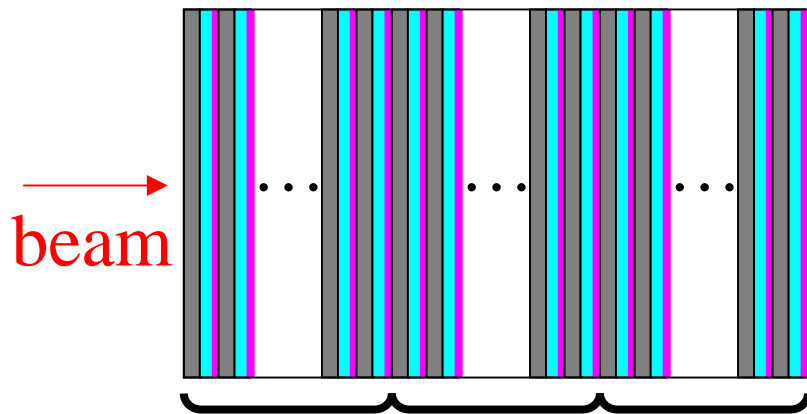
Configurations of layers @ DESY

We can select 3 types of scintillator layers.

S1 : KNU strip + WLSF + MPPC

S2 : Mega strip plate + WLSF + MPPC

S3 : Mega strip plate + MPPC (Direct coupling)



W/S1 W/S2 W/S3

9Lys 9Lys 9Lys

We may test some different configurations with the 3 types of layers, but still under discussion.

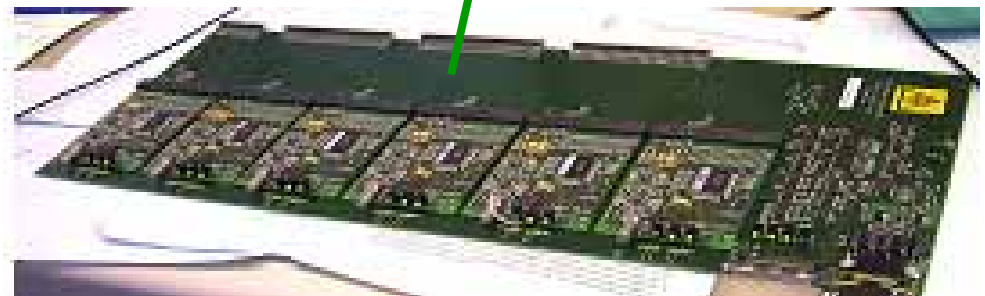
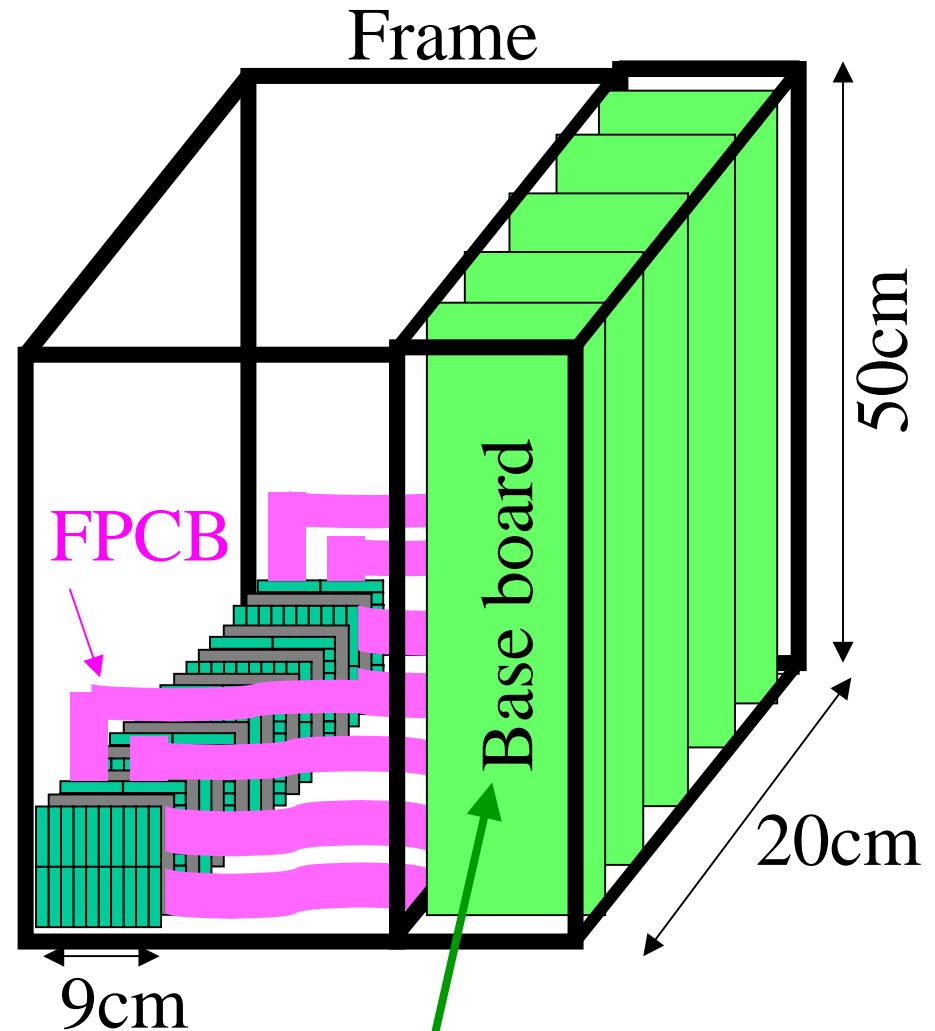
Readout

MPPC signals are fed into the readout base board via Flexible Printed Circuit Board (FPCB).

Base board

- 108 channels on a base board
- For AHCAL (SiPM readout).

Thanks to DESY-CALICE friends for the base board.

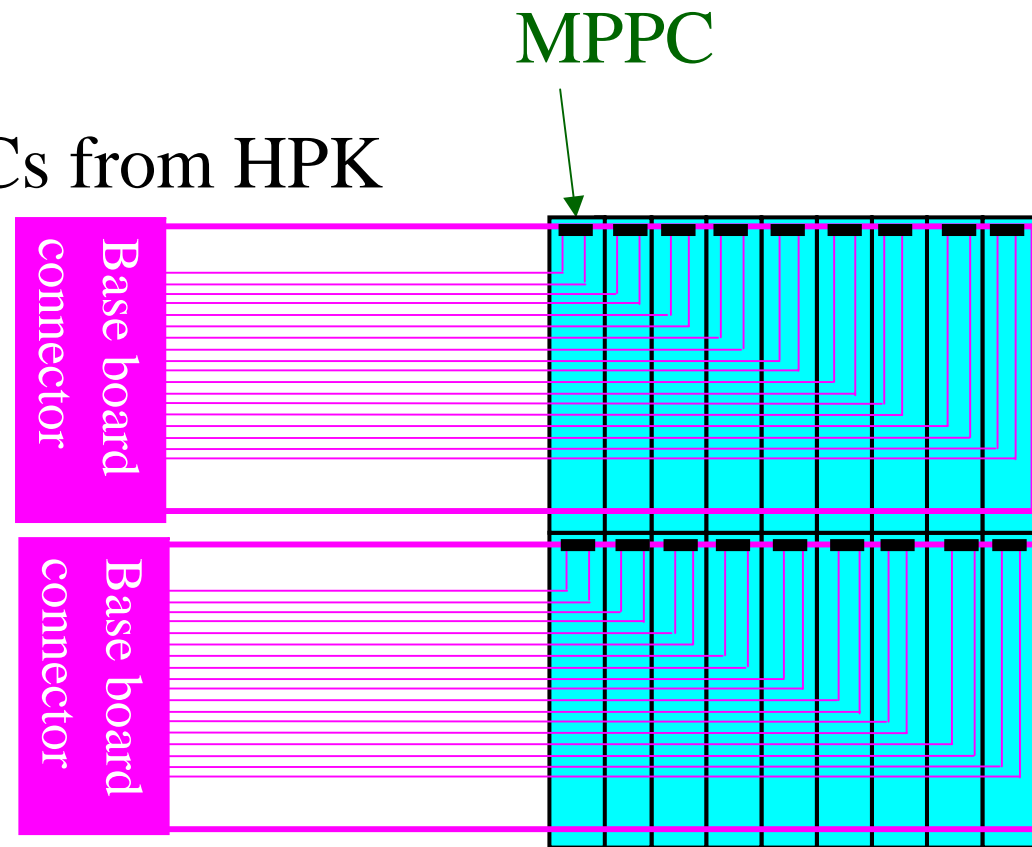


Next steps

After we get 500 MPPCs from HPK

- Gain check by LED
- Connect with FPCB
- Set in Scintillator
- Signal check by Sr
- Cosmic ray test

Need 2 or 3 months



The prototype will be tested scintillator strips with MPPCs in EM shower at DESY in this winter.

We would like to report the results next year.

Thank you very much.