

TPC Status

from personal view point

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TPC Overview

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LCTPC

Status of LCTPC

Baseline

Pixel

Process towards tech. Choice

TPC in Japan

Recent study

beam test result update Aoki

2-track separation Shoji

**Since the last ann. meeting(held @ March)
we have No real progress**

COVID-19 is the one of reason,

but ...

We don't know

what we have to do right now

ILC may start someday soon(?)

but we have no budget yet.

even If we had some money,

History of LCTPC-japan

Main Tracker(CDC) group for JLC (1990s) start R&D

the first goal was Jet Chamber (mini cell) more like SLD

4m-long wire is not easy but probably possible for X-band LC

2003 ILC starts w/ cold tech.

TPC became the first choice as the main tracker after severe discussions

2004~

LCTPC collaboration start

R.S. brought MP-TPC(protoype; but wire chamber readout) to the group

which was modified to do MPGD type readout

study w/ MWPC TPC @KEK PS w/ 1T solenoid magnet(-> PCmag @DESY)

(2004)

GEM based TPC (2005~)

Micromegas based TPC w/ SACLAY group (2006~)

in order to evaluate the performance

History of LCTPC-japan(2)

2006 GakujuutsuSousei start

toward LP1 (prototype test) test at facility @DESY

GEM based module design with Scienergy GEM , Gate

pre-Prototype study for Prototype R&D

“failure was the greatest teacher” by Yoda

GEM R&D

LP1 module design

Gate design (2007~)

simulation

production 10um thick (2010) but trans. ~50% as geom. ap.

module fabrication (2008)

1st Beamtest@DESY (2009) w/o Gate

Large Field Distortion by many reasons

lack of Gate

module edge region

+ field shaper (substitution of Gate part)

History of LCTPC-japan(3)

2010 Beamtest w/ field shaper
discharge problem...

2012 Beamtest w/ Gate (the final year of GakujuutsuSousei)
w/ trans. ~50%
discharge .. no data.

2012 Gakujuutsu -> Tokusui

Main theme of Tokusui was making realistic module
including RO electronics/cooling

but Gate was not fixed yet; improving trans. is another project

Fujikura join Gate R&D (2013~)

prototype 2014 provide 80% trans.

module size completed 2015

module w/ Gate (goal of gakujuutsu) test @2016

-> beamtest data seem to meet the goal of TPC performance

-> still on going

@the end of Tokusui we met the goal of gakujuutsu (5year delay)

new(realistic) Module design -> ???

much complains but no solution (yet)

History of LCTPC-japan(4)

After Tokusui (2017~)

No progress on Hardware side,

though grad. students study hard

analysis and sim. study / propose new GEM design

but no budget cannot support

module design ..

other effect: realistic electronics : sAltro-16 is still not ready

What is the motivation to make the next module !?

What we have to demonstrate before LOI

missing realistic electronics/cooling is big disadvantage!!

We spent non negligible budget for sAltro but ..

But this may not be the all reason we cannot design the new modul

after look back our History

Japanese group had essential contribution to LCTPC
understand position resolution (exp. and theor.)
R&D for Gate device

Our progress was @ the beginning of Budget
Money could boost the motivation, activities
Once budget had gone, we might lose momentum.
But I'm not sure the motivation is rechargeable by money?

We need something new!!

We are missing new comer for a while

Iwate Univ. is the latest (2015 ~)

we need new idea/ critical discussions

Where we go

Kindai and Iwate univ. have studied ceramic GEM

KEK study glass GEM(simulation)

each inst. try new idea/comp.

These studies may become seeds for the next module.

Pixel TPC seems to be realistic now

conventional technology (GEM, Micromegas) is better ??

has any advantages ??

ADC-> Pwr consumption -> cooling

Pads need new electronics(cost ?)

Pixel is just beginning of realization stage

real difficulties may appear later ... ??

Pixelized gas detector -> innovation,

Demo. for LOI

We have to convince “TPC can be Main tracker for ILD”

Basic performance almost meet the requirements
resolution, dE/dx, Gate, @1T B field

Realization — on the way

basic components had been tested,

Integration of all function onto module.

GEM-based module : no test was done w/ real. RO

but Micromegas demo. compact (AFTER)RO w/cooling

there must be no reason GEM module cannot do the same thing
(except # RO channels is twice)

What we can do ?